

AVIATION

The Oldest American Aeronautical Magazine



SOUTH AFRICA knows *the Hum of the Hornets*

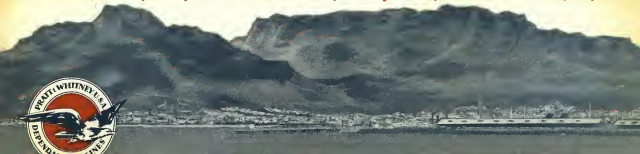
High over rugged peaks, dense forests and trackless wastes, the Junkers planes of South African Airways wing their way, day after day, month after month. As they speed along toward their scheduled destinations, the hum of the Hornets and Wasps has become a familiar sound, for all of the planes in the service are powered by Pratt & Whitney engines.

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Shen Shichang 1986



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Two years ago air transport was in its infanticidal beginning. Few planes were able to complete the world tour in its infancy. Delays and cancellations were common.

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PERFORMING A GREATER SERVICE

[illegible]

And today Parker Life College, Inc., is performing a service that is worthy of substantial recognition. So deeply impressed by the work being done at Parker was our Executive Vice President, prominent in creation when he made a survey of the nation's institutions that he was moved to write shortly after:

"I should like to say again, as I did in St. Louis, that your effort is very impressive. The future of writing, science upon science when we know that such construction steps are being

taken in the education, risk was who will own the pipeline today (in the field). It wasn't as a reason for the failure of the industry."

AN INSTITUTION SERVES A PURPOSE

It is the primary purpose of *Police At Collin* to provide facts relating to men who report, in time, to various portions of such more than appear immediately.

Emphasis is placed on the development of skills, but skills are basically important and, moreover, it is skills that best opens the doors of creation to graduates.

And many of us in Boston who can do mathematics thinking that respectable positions yet, the training is made good and the ability of advanced students to think problems through to a conclusion is increased.

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PARKS AIR COLLEGE

Keywords: child sexual abuse; disclosure; social support

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AVIATION
Department 367



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KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

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The Birdmen's Perch

Once a few of the fellows who used to congregate on The Perch began to put your address on your letter, and we knew the don't care crew got into touch with you. The idea went to make further inquiries, to do the "Tucson Way" that a good run and put your address down when you send along your mail.

NOTE: Mr. MILLER, they "Tucson Way" it's the Arizona Gold Avenue Post Office Building, Flagstaff, Ariz.

THE HE-MAN OF DEATH VALLEY

Back in 1929 I was working as a Cali finance expert which had any of the old ad collections of aircraft catalogues on the Pacific coast.

One day they suggested in the name of them all, a Tanager House One Place House of various things. It had a La Rhone motor engine.

Now, the pilot claimed he had 400 hours on the La Rhone without a single landing. I thought he was a real hot, but a look inside the panel showed that he was giving the straight dope. It was built with copper oil sump half as much thick and baked on hard.

The he-man who flew this airplane that long, did so over Death Valley.

I mention this story because some of our readers here operators think they're doing well when they operate a modern engine 400 hours without a landing.

In order how long the La Rhone really would have functioned if it had had the expert attention of modern mechanics and such good as at Gulf port out.

WALLS L. 1015, Burbank, Calif.

GAS DEALER WINS \$14,400



With the birds we have dozens of meaning a divorce on the Soap-operated, but it took Rudy Kling, gas machine operator from Leavenworth, Ill., to really close up.

Rudy, an 1000 Lb. man, was the big cut piece at the National Air Race. To a place of his own design, he won the Thompson and Green Trophy Race, and \$14,400.



It is a pleasure to Gulf that Rudy and Gulf Aviation Gas and Gulf Oil Co. is in place.

HE MISSED THE HEARSE AGAIN



That nervous businessman whom the Cubans took got shot at (see August Perch) must be the same one I know. He lost some Cuban money. All told about, this guy heard that there's a leg-shoot rebel's funeral going on in another part of the island, so he rushed out to the Havana airport pronto.

Now he pulls for somebody to fly him to the spot where the funeral is to be, and not turn a phrase in uniform. He grabs the controls of the nearest ship and the captain's chair is a work to do.

The ship lurched suddenly up the runway and finally roared up into the air. After they got off the ground, the pilot expressed that he's never flown a ship before, just makes a few turns. Here's a rebel who seems to get out of Havana just now.

The rebel and the businessman (who'd close into all day, but no pilot) finally did get the ship landed at the right spot. But they were too early for the funeral. The Cubans in the ship must believe it or don't believe it, the leg-shoot rebel who was supposed to be dead.

R. W. New York City

THIS WOMEN'S WHOPPER

Dear Sweet Chick, I believe half the biggest trouble in the world. Which is true, even he got it here greatly bear. And the only reason that some bear are a piece of meat is that all low back in Gulf Aviation Gas.

Two men, nervous out of gas in the region,

time, and had to walk four-five miles to a better station. All we had to take gas in was my car.

The mountain headquarters is full of small caves. My car hauled back to the car, with me slouching the corners of Gulf, was out of a cave corner this bear. Chuck, thinking you could find, again down on his hands and knees that leg mouth of his as wide as he can. The bear shook his just another cave, and there's Chuck again, there while he takes out after me.



It's game on me, too, and ready to be angry, until I see his my car and takes a trip. When that Gulf hit my car, I went about ten minutes later in the air and came down again. I started across the valley, I wonder down there on trees, my hands together, my hands together.

The Air entry Service is still writing me letters. Well, guess, think of these stories, I'm going. Please City, I'm sure, miles away. About the story of that Gulf come off, it took me two and one-half days to walk back.

Sincerely yours, Bill Gray

P.S.—Oh, you I near forget Chuck. He is still holding his mouth open when the bear goes back from chasing me. I'm sorry, well, you, up until the bear decided that was the game he wanted to live in.

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AVIATION
December 1937



Number 11 is a series of photographs showing selected features of new composite structure, complete air cabin, 1100 golf building, Fairbanks, Alaska.

AS STRONG AS THE RIVETS



Rivets, here illustrated in a pattern that gives unusual emphasis to their structural function, have kept pace in structural development. All Alcoa aircraft rivets are now produced with special attention to grain structure, which facilitates the bearing of most loads. And today proper choice of alloys makes it possible to do the major part of riveting on aircraft without heat treatment in the factory. Thus rivets, too, exemplify how alloys of Alcoa Aluminum are continuously improved to meet increasingly exact requirements of the aviation industry.

ALCOA  ALUMINUM

AVIATION
December 1937

NEW WINGS for the NAVY



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SIKORSKY
DIVISION OF UNITED AIRCRAFT CORPORATION, BRIDGEPORT, CONNECTICUT



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Young Man!*

LOOK UP!

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Also inquire about the 25MA File for an antenna which is a Department of Commerce's standardized instrument. The file allows you to know in advance the location of the weather service of the nearest city.



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How to Achieve HOMOGENEOUS METAL STRUCTURES and PERFECTLY SMOOTH SURFACES



ROUND WELDED JOINTS ARE NOT TO BE FOUND IN a single homogeneous metal unit. But when the welding process is controlled, clean joints and smooth surfaces are obtained and the structure is finished in a single piece.

WITH NO SPOT WELDS TO interrupt the surface, structures obtain structural uniformity in all directions.



A LEADING authority in aircraft design recently listed an important and basic remedy in permanent development. Among these are the continued use which refers directly to the plane's construction on more homogeneous structures and smoother surfaces.

U.S.S. Stainless Steel is a special strength grade offering an excellent means to achieve these two important objectives.

Since stainless steel construction

can be welded, the entire plane—wings, motor supports, fuselage and landing gear—can be made one virtually homogeneous metal unit. There are no rivets to loosen. No joints to open. No joints to vibrate. And since there are no spot welds to interrupt the surface, smoother surfaces can be obtained and skin stresses reduced to its apparent minimum.

Stainless steel construction also offers other important advantages. The high tensile strength of the metal and the designer's freedom to more efficient structural sections with

a higher modulus of elasticity, make possible a strength-weight ratio higher than that with any other metal. And safety is increased, even stronger steel is unnecessary to weather and current stresses as disastrous with time.

Stainless steel construction offers to aircraft designers an interesting opportunity to build new planes which use lighter AND stronger, better AND safer. Our nearest sales office will gladly supply full information on the properties of the wide range of special grades of U.S.S. Stainless Steel for aircraft construction.



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UNITED STATES STEEL

shocked everyone. But company traditions are being earned as well by Archibald M. Hall and Charles T. Pope. Among the many interesting projects underway is an overhaul job on several Coast Guard boats that have been in constant service for a number of years. When the structures were examined it was found that great trouble on corrosion had taken place in spite of the fact that the boats had been used exclusively in salt water operation.

At Trenton we were out to see Don Loomis, his test dogs, his airplane and his plant. Don has an entirely new solution to the problem of greater production which furnished food for thought for all private airplane manufacturers. He tells his story on page 38 of this issue.

On Long we couldn't resist a look at the New Jersey State Fair while we were in Trenton. We had no major gates inside the state gate when we leaped quickly into Al and Mrs. Brown who had picked up the last spot on the fair grounds to exhibit a Ceb and tell the world about it with some signs and a loud speaker system. On page 30 is a photograph we took of the exhibit. Other progressive airplane manufacturers plant stops.

On New York the Pennsylvania Aeronautics Society was dropped in on William Koffel and Fred Travers who are busy building airplanes for the Navy. Fred has come back from his recent trip to Europe full of new ideas about propellers, other things he reports that the French air building can do that work, 3400 lb. which planes are watching with great interest.

IN ACCORDANCE TO A REQUEST OF AIRCRAFT ENGINEERS, information on



regarding the effect of rain on the burning of engines has been received by the Navy from tests recently made with planes from the Naval Air Station, Lakehurst, N. J., the Navy's only jets. It was found that during a series of experiments made by releasing birds from a radio station at Ocean Gate, N. J. (15 mi. or about 6 miles) while it was raining, that the planes climbed to an erratic and confused manner very close to the ground, and were from 42 to 52 minutes returning to base base but the birds were flying without from the same station while it was raining (under the same conditions of wind and weather) under in conventional manner, departed for home base within 5 minutes, arrived within 19 to 21 minutes. Of course, the series of tests were short, but it seems clearly indicated that carrier planes are affected when released with a rain-making radio station. More extensive tests would be required to provide conclusive results.



"Moose" quailed for student last Saturday night.

On Connecticut in Rio de Janeiro, regular U.S. mail flights of Pan American Airways are made by air to Rio de Janeiro. Traveling over Pan American Airways routes to Rio de Janeiro the passenger service there transfer to domestic planes for the transatlantic flight to San Francisco where they again board PAA ships for Rio de Janeiro. On past Pan American flights in an exacting manner in the world, for crop and product control by the U.S. Department of Agriculture.

On Reporting to SEATTLE'S AIRPORT "How Brown and Silver" in Aviation (October 1941) the caption under the cut on page 35 was unfortunately transposed in printing. The caption "Fig. 6—etc." applies to the cut in the lower right hand corner of the page. "Fig. 5—etc." belongs with the cut in the upper right hand corner, and "Fig. 7—etc." goes with the cut in the left hand column.



Consultation

An excellent suggestion, made by one of our technicians, just late enough to involve a sizable change-over expense, was accompanied by the remark, "It wasn't in our department, and I didn't like to bother those fellows before."

The statement made us wonder how we been reluctant in urging consultation between aircraft engineers and our own technicians who are specialists in brake, wheel and shock-strut design and construction?

There's more opportunity to incorporate good suggestions during the early stages of design than later when plans have "jelled." Why not consult Bendix before the next disadvantage is laid out?

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BY
**ROBERT
OSBORN**

TO DISCOVER A ROMAN TOMB believed hidden under the earth near Angmering, England, a flyer has been employed to send it to down the air. Not long ago a Roman lady was discovered in this area—Mrs. Don.

Come, come, Johnny! You've just better efforts in Spain and the Mediterranean got you down. These



low probably had nothing to do with the construction of that tomb, or the villa either.

CONSIDERING THE TIME AND TRIP involved in the construction of military aircraft, it is surprising to make deliveries to foreign countries before shipment are put in effect, no wonder it is surprising to read a news item something like the following along about 1936:

"Today authorities agreed to send five airplanes each, which were loaded lying in an obscure corner of a road just in San Pedro, California. The

shipping cases were labeled 'Military Supplies' but the cause of the confusion had been discovered. Markings on the boxes indicated that they had been consigned to the Spanish Loyalist Government in 1937, then to the Chinese Nationalists and then to rapid movements to all other nations of the world except the Duchy of Luxembourg. The boxes contained nothing but scattered and rusty metal bits, and badly yellowed and faded sheets of paper giving instructions as to how to use the machines."

WE ARE VERY GLAD TO REPORT to Aviation readers that these last, new, unloading airtail letters are still managing to pick off a few percentage of the beautiful exterior and interior of the planes. This is up to the continued strength by military forces to take all of the remains out of aviation by various and unorthodox methods. Several of these attempts we have called to your attention recently, such as the design of a new airplane to spread the wings in large farms, and the order to Army aviation to remove all take tanks before starting flight.

BEHOLDING OF SOMEONE IN AVIATION, there's another activity in the business, that of which we do not

entirely approve—the defense trend toward simplicity. Simplicity in the rubber control, single-blade propellers, automatic spray and motor controls, compasses instead of dials, and so on.

As a youth we had the greatest of airplanes for the time "Bristol" airplane which had four cylinders as big as beer kegs, no radio, a dash-board covered with instruments and levers, and two thousand pair of feet and leather levers mounted on the outside of the cockpit. We hoped some day to own a special one of these cars with a gas lever as big as a broom or reverse lever, whereas we now drive one of the "all three low-pitch cars," which is as simple, and as romantic, as a wheelbarrow.

Of course all of this simplicity is essential to the future of the business if we hope to have the general public flying and buying, but an old tradition must be allowed to shed a few tears for the rapidly departing remains of flying. Our last strong hold of simplicity, and consequently romance, in the transport plane, is the flying of which a pilot reads all of the factory of a pipe-organ, but first thing you know they'll be making these planes simple too.

THE OLD saying that "You can't improve on Nature" recently gets broader interest even in a while. A United Press dispatch states that these



roads of perfumes which were stranded in Austria due to premature cold weather and rain had been subjected to a large and heavy loss by airplane to their water losses in the south.

Mrs. DORIS DICK CROWELL, who is reported to possess a number of millions of Mr. Roosevelt's 40-cent red dollars and her husband, James H. Crowell, who is not badly off financially himself, recently announced their plans to "commence" to live between the 2,800 acre estate in New Jersey and their new home in Honolulu.

Her latest might well appoint Vice-President in Charge of the Crowells.



ANOTHER WINTER

ONCE AGAIN the sun has swung away from our northern latitudes and we stand on the threshold of another winter. The average citizen is narrowing his acquaintance with his coal bin, is shaking the moth-balls out of winter overcoats, and is shaking off his sea-anemone. And as the autumn—corrosive lemons (and other de-frosting devices) are gone; ice, wind and cold everywhere are being felt, and anti-static "car-mats" are being applied to radio antennas.

Never before has such an array of gadgeted gizmos been at hand to help lick the problems of winter operation. Each one represents a vast outlay of brains, energy, and money, but each is essential for safe operation regardless of cost. The whole industry may well be proud of the way in which all its departments have risen to the occasion when called upon to meet some new and unexpected problem cropping up in actual operations. We've gone a long way in a short time.

But, while taking pride in accomplishment, it is much more important to remember that after all these things are only mechanical devices,—that they can't do much thinking for themselves. At best, they can be only the tools with which we as human beings may work toward greater safety. The old automobile gag that safety depends mostly on "the hair that holds the wheel" still holds good.

Here, however, we are not thinking particularly of pilots. Far from it—for the wheel of responsibility that guides the destiny of our air transport is a much bigger one than any found in cockpits, and hundreds of hands are holding it. Every mechanic's finger to top executive, every man in the business has a hand on it. In no other line of group endeavor is responsibility for ultimate performance so widely spread. Probably in no other industry can individual attitude or responsibility have such far-reaching and such disastrous results. We have said that before, and we will state it again: for saying it again is as important as possible, for the recognition of the concept of shared responsibility is the only solid foundation for safety in all aviation activities.

Once the principle of shared responsibility is accepted, a full-blown accident immediately pops up,—its inevitable cooperation among all groups is essential.

fish. Here again we are covering a broad field. To the obvious need for cooperation among pilots, dispatchers, weather men, engineering and mechanical personnel within any given organization must be added the positive need for closer and closer cooperation among the several operating companies themselves. Cooperation may make for a healthy state of affairs in business generally, but if carried to extremes, or applied in the wrong spots, may easily prove to carry with it the seeds of self destruction.

With the coming of winter this year air transport is facing what is probably the most critical period of its history, not excepting the debacle of 1934. The repercussions of the tragic winter of 1936 are still echoing in the minds of the traveling public. The traffic figures for this year, although better than for any prior period, show unmistakably the depressing effect of last year's accidents, and it is safe to say that the volume of business that can be developed for 1938 and 1939 will depend to a considerable degree on the performance in terms of safety of this winter's operations. Even under the best of circumstances the going is not going to be too easy in the next couple of years. The competition from other forms of transportation is getting much keener, what with the improved speed and comfort of the railroads and bus lines, coupled with their extremely low fares. And with Douglas DC-4s, Boeing 307s, and possibly other types of much larger machines in the offing, easy access must be sold to maintain occupancy percentages at an economic level.

So, it all boils down to one thing. If air transport is to come ahead into its proper place there must be no repetition of the events of a year ago. Further than that—there must not be a single accident or any action during the winter of 1937-38. It can be done, and it will be done if all agencies, governmental and private,—if all individuals from top to bottom,—keep forever before them the recognition of personal responsibility and subordinate all other interests in the single objective of Safety through Cooperation.

As we go to press, rumors spread of the loss of an aircraft in the West—leading traffic emphasis to the above remarks on the need for utmost care in all operations in the months immediately ahead.

A SHOW FOR '38

WHEN WE ASKED THE INDUSTRY (by questionnaire) in May this year whether or not aerial shows were a good thing, 86 per cent of the people who replied declared themselves in favor of annual exhibitions. Over

90 per cent wanted shows to be national in character, and the majority pointed out the desirability of a central location. (Aviation, July, 1937, p. 38).

Now we are about to get a show that conforms almost exactly in specifications to those written by the industry itself.—The International Air Show scheduled for January 28 to February 6. It comes early enough in the year to provide the active buying season, thus focusing attention on 1938 models; it is definitely national in character, with Class A machines by the Aeronautical Chamber of Commerce; it is centrally located in Chicago's International Amphitheatre. Along with it will be held a number of meetings of general industry interest, among them a national gathering of fixed base operators to concentrate on some of their common problems.

Already an active interest is manifest throughout the industry in the Chicago project, but like all other efforts of the sort, it will be a success only if all those who voted favorably in the spring turn out and back up their expressed desires with active support. There is an opportunity here for the American aviation industry to really show what it can do on a scale comparable to that of the great European shows of Paris and Milan. Let's go!

THE THREE WHEELERS

IF ANYTHING that looked like a trend cropped up in the Cleveland Races this year, it was the re-emergence of the triangle landing gear.—Gwinn's Arrow, Waterman's Arrowhead, the Stearns-Rammond, and the new Waco N were all three-wheelers, and probably by this time next year the triangle mounted transports of the DC-4 class will be familiar sights on many of our airports. We were much interested, for we have felt for a long time that there was real merit in the idea. And we like to think that we helped the cause along a bit by publishing such articles as Frank Courtney's "New Wheels" (December, 1935), Fred Weick's description of his W-1 (January, 1936), and Shelby's "Two Wheel or Four Wheel" (June, 1936). Also, Aviation's survey of the industry on the specifications for the ideal light airplane ("This Light Plane Question," December, 1935) disclosed a very great interest in the arrangement by manufacturers and users alike.

The appearance of the triangle gear, and the current crop of unconventional airplanes, seem to point up the fact that, for better or for worse, airplane designers are again letting their minds run free of conventional tracks and are beginning to let them ramble a bit at will in unexplored territory. A good thing, we said; it



Camera's Eye on the News

1 Boeing flying between the Air Corps plane and the American Legion's 50th Avenue Parade.

2 German squadron fly past the camera, lay out at the West's home country display on...

3... Gearing himself and Hiler look up.

4 Dr. Robert White after work in the Radio building for the American Legion in New York to get landscape equipment for his job.

5 Charles G. Gearing flying the new Gulf 3. It is the fastest yet in the world, though it's not the best speed, 1937 m.p.h.

6 The Hays Corporation is at last completed. Both divisions have been announced ready for their second-up jobs.



RATIONALIZING

Aircraft Production

1937 S.A.E. National Aircraft Production Meeting brings better understanding of aviation industry methods.



John A. C. Warner, S.A.E. General Manager.



R. A. L. Stein, chairman of the Thursday evening meeting.

CONSIDERING THE REMARKABLE ACCURACY achieved in by the new production meeting of 1936, the 1937 National Aircraft Production Meeting sponsored by the Society of Automotive Engineers, drew engineers and associates from all branches of the aviation industry to the seven sessions held at the Ambassador Hotel, Los Angeles, on Oct. 3, 8, and 9, and, as in 1936, the sessions were planned morning, noon, and night with rapidly growing crowds. That is spite of the current World Series baseball and the football games of Saturday afternoon. A list of the 700 persons who registered officially would read like a Who's Who in aviation engineering, and nearly to list all the firms represented would require cataloging the entire industry.

Watson, executive engineer of Chrysler Corp., was its personal undersecretary. Past S.A.E. presidents Win D. Stopp and Edward P. Warner repeated their roles in 1936, the former as master of ceremonies at the Annual Banquet, and the latter making the presentation of the Wright Brothers Medal for 1936. Carleton K. Stanley, Chief Engineer of Curtiss-Wright, Technical Institute, again served as general chairman of the meeting, supplying the major burden of planning the details responsible for such outstanding success.

Claiming the aviation industry's first place for 1936-1937 production year, with aircraft orders running twenty-five per cent ahead of 1936 and with backlog throughout the industry at one high for 1936, the

meeting properly focused thought on the production problems prevalent in the aviation field. Mutual problems were discussed with understandable frankness by those in attendance. The keynote of such candor was struck by John A. C. Warner, S.A.E. General Manager, with the statement, "It is not a matter of sharing secrets but of avoiding economic waste."

Although the Wright Model five year was presented for a paper read at the 1936 Production meeting, it became evident early in the current sessions that the papers offered were more representative and for coverage of the aviation production problems was most comprehensive, thus far year. Particularly gratifying was the obvious appreciation of data in attendance that production means manufacturing entirely different in aviation than it has come to mean in automobile run. This was well put by D. M. Carpenter, of the Consolidated Aircraft Corporation, in his paper on Factory Equipment and Tooling with the following comments:

"By far the most outstanding feature is the policy in connection with aircraft factory equipment and tooling in its general industry. . . aircraft factory budgets are limited by the comparatively small size of aircraft contracts. . . The luxury condition, therefore, must be es-

tablished on the alert to avoid having the knowledge of mass production practices run away with the judgment concerning the expenditures allowable for equipment and tooling. . . The person shows something on the order of an average of two duplicate parts per airplane. . . Regardless of the fact that production plans change in design and specifications are subject to other, that it is doubtful if two absolutely identical airplanes ever leave the factory."

Also highlighting the meeting were the comments of operators, both civil and military, stressing the importance of producing airplanes that can be easily and quickly maintained and overhauled. Operators properly made the point that original designers frequently have little appreciation of overhaul problems and methods. This focusing of attention on the design of an overhaul problem struck one as being a milestone of more than usual significance on the road of aircraft design development.

Now it is obvious that we are entering a design and production era where the greatest attention is to be concentrated on designing and building equipment which will achieve a maximum life with maximum maintenance attention and the utmost susceptibility to complete rebuilding by the operator. Now with such crystallized and a relatively heavy volume of passenger, civil and express loads assumed, the engineers can turn their gaze on the multitude of design problems connected with keeping airplanes in the air more hours per day at less dollars per hour.

Not all of the sessions were purely technical. At the Thursday evening meeting on Internal and Impromptu talk given by Edward S. Hensley was enjoyed immensely by the large group in attendance. Hensley, now 72 years of age, a consulting engineer for the High Trust Co., and was one of the original founders of the Society of Automotive Engineers. He inspired his audience with a comparison of transportation progress made in his own lifetime. Attending with E. S. Hensley was his son Ashley C. Hensley, chief test engineer for Menasco Manufacturing Company.

Also of outstanding interest was the visit to the Caltech, Division of Technology. Under the director of U. C. Ruckelshaus, Caltech's aeronautics professor, a group was shown through the aeronautics laboratory and wind tunnel, high speed wind tunnel, low speed, hydrodynamics laboratory and the optical laboratory where glowing work on the 200 in. airspeed tunnel is (Continued on page 67)



One of the meeting groups at the Ambiance.



Left to right William S. Stiel, Donald Wood, T. F. Wright.



Left to right Edward S. Hensley, Ashley C. Hensley, Carleton K. Stanley.



W. C. Ruckelshaus talks to a group of his visiting guests.



All Douglas planes originate here in the Douglas engineering department, as shown here it is laid out to make and receive 100 to 150 sets and with final sections for construction purposes.

The completed DC-3 fuselage is mounted on a dolly and rolls down the assembly line.

Below: Wing department where DC-3 wing panels are mounted in refitted jigs.



Line of DC-3 fuselages as they're brought in background the planes are final assembly with attachment of engine section, landing gear, wings, etc.



Here the DC-3 is in the final assembly bay where it is receiving engines, instruments, landing gear, and all accessories.

Turning Out DC-3's

From Drawing Board
to Final Assembly



Douglas DC-3 fuselages are laid out in this two story bay which can be used to work inside and out simultaneously on two levels.

DC-3 powerplant sections are assembled complete from forward forward as these provide an easily lift and are then rolled out in the final assembly bay for delivery to position on the plane



Interior of the DC-3 fuselage structure as it leaves the primary jig.



The giant Douglas shipyard known to the largest airplane maker in the world



By Don Luscombe
President, Luscombe Airplane Corporation

Out of a Hat

Don Luscombe pulls airplanes out of a vest pocket factory as easily as a magician pulls rabbits out of a hat. Here is how he does it.



Merely it was back in the late last years of the depression that we got to playing with a child's contraption toys and decided that the Meccano-Praxair principle was the way to build airplanes. Airway it must be changed to the depression because twenty years of primitive experience in the airplane business had not brought out the right idea.

But getting back to the Meccano. There it was in a compact little box with all the necessary parts to build

skyscrapers, bridges, locomotives, or what have you. And any normal twelve year old could put these together. Translated into manufacturing terms and you have a small factory and small overhead. You let the specialist manufacturers buy the expensive machinery and fancy materials

for such operations as extrusion, stamping, forging, and all the other usual factory operations that the small manufacturer of airplanes has no business attempting to duplicate.

After airplanes as Meccano sets are designed and built by hand, tested, and reliable, then comes the task of

Stamped bulkheads for twenty five thousand sq. in. into this small size and, like a standard brass, you leave how much with plate cuts.

In this small corner of the plant prefabrication sheets are quickly checked to stamped bulkheads of the fuselage. The check of standard bulkheads in the background is produced quickly and takes up little floor space.



designing the dies and tools for specialized machine operations. Hundreds of parts must line up. Great holes must be made. Progressive effort in tool-making is required. One die is dependent on the die that preceded it. Overing all of the day's holes and all of the night's holes may be a practicing factory, but it won't substitute for the required time element to make parts fit. Sometimes it seems to take a few thousand-day days to hatch the egg but twenty are born are not much help in getting the egg hatched in a single day.

A careful survey of one's funds will reveal a world lack of appreciation or knowledge of the superlateness necessary to make a large die or a casting die, which, when put into a machine operated by unskilled hands, produces certain items which can be purchased for a few cents. Oil waste when not properly tested and equipped are even assembly job sets or airplanes out of a vast pocket representation about as fast as a magician pulls rabbits out of a hat. It sounds very simple and it is that you arrive at the proper formula but you can only get there through a maze of complications about those parts, and several thousand dollars.

By this time you are about to dig out the word "volume"—that little air baptism of quantity production. You realize that there is no use designing an airplane that can be stamped out and put together like a Meccano set, what makes you can get enough orders to make it possible to stamp out a lot of parts thereby absorbing the tool cost. Since we had no resources, diagrams many years ago when we introduced into production small cabin airplanes which form the basic design for most

of the small ships sold today, our inventory was not too big to believe that the thirty spread domestic market will absorb fairly soon a testing setup. But it is a big world and we looked beyond our national borders and found a few buyers.

Persons experienced in aircraft design seem to have a custom design, and lack of interest for an export customer gave small satisfaction in such a customer and the foreign dealer. Putting stamped parts for twenty airplanes in a truck no larger than necessary for one assembled airplane meant, affecting the worst customer economy and a violation of the selling expense, worse freight, and the dirty problem in foreign fields. Under our supervision our foreign friends our assembly airplanes as easily as we do it here. Foreign financing is therefore the result of the three phases of our

business. The business like it because they get a tested design, avoid engineering expenditures and get three dollars for every ten per cent of what it would cost them to set up themselves, some results, gaining that the specialized knowledge was available.

Actually there is a difference between playing with a Meccano set and assembling an airplane. And that brings us to the third phase of our business. One of our greatest problems is in training men, not only to get the airplanes together, but to teach them to participate in the integrity of tool design and production processes so that the airplanes will go together like a really old house in putting a roof on a modern automobile. We must not only build airplanes, but men.

Graduate mechanical engineers were first trained for our training. They came from our best schools and



The aluminum fuselage of American took the run to turning out three standard wing spans. They are exactly matched and their own dimensions in what shop is your plant.

Two-thirds for the machine pressing inside cabin holes. Fixed surfaces are assembled from the components.



MAINTENANCE—most of them were trained to be chief engineers and vice-presidents. They were extremely high in I Q but woefully low in practical application. After a year or so of careful supervision, almost countless, radios, research in metal processes, an educational system combining engineering and shop practice was devised. We repeatedly required a higher degree of per capital knowledge than is available

(Continued on page 72)

"Down Under"

Australia, South Africa, and South America still offer untapped markets for U. S. aviation products. Some special conditions pertaining to the South American field are covered herewith. Studies of the other territories by other observers will follow.

MORE EXPERIMENTAL AIRCRAFT and equipment manufacturers have more than a mild interest in the development of foreign sales but as some customers have become discouraged because of the difficulties of carrying on their affairs in a foreign country without first-hand knowledge of the sales problems (which are invariably different than those they are accustomed to meeting in the United States).

There are at present five great potential markets for American commercial equipment. Two of them—Canada and Mexico—by their proximity and close association with our country, are particularly "ready made." The other three, South America, South Africa and Australia, all below the equator, are worth definite attention. This article is pointed directly at the South American market because of the difference in people, customs, languages and business routine. Nevertheless, the others should not be ig-

nored when considering the possibilities of foreign business.

One of the prime reasons for developing sales below the equator lies in the difference in seasons. When it is winter in the North, the birds are singing in the South, and vice versa. If, therefore, South American sales can be built up by planned effort, then the slow winter season in the United States will become something more than a long New Year's.

A check of the export figures for the past ten years gives only a part of the picture because the breakdown between military and commercial export equipment is not evident. For example, Brazil has purchased approximately \$6,000,000 worth of American aircraft and engines in the past five years, 1929-1933, but practically all of this amount has gone for military equipment. Five years ago in Rio de Janeiro there were only five privately owned aircraft; a Fiat trainer,

a seafaring Moth and a small Swiss-Marchetti boat. There were no commercial airports, no fields that could possibly be called airports. Today there are six or seven flying schools, one of the finest municipal airports in the world with other fields for private flying completed or under construction, and forty or more privately owned aircraft; the majority of these being of American manufacture.

The development in the past five years is primarily due to the worldwide interest in aviation. Particular development of commercial and sport flying in the Argentine and Brazil can be traced to a number of sources. The wealthy young Latin-American millionaire for say today that will put him a match above his companions, the prestige of owning and flying his own airplane and the opportunity to travel farther and faster in the pursuit of other business interests. The governments are interested in giving amateur and commercial pilots every consideration as a means of training additional pilots without undue expense to the air service.

Many private schools are spreading in the larger cities, some subsidized by state or government to the extent of lands for equipment and a home for even students trained. Fields are being designated and improved for the private flyer. Bureaus of Civil Aeronautics are becoming stronger and are planning diligently for the future. Such things are being done about South American aviation development much faster than the similar period we passed through in the United States, because of the availability of fine equipment and a great wide range without need of technical development.

Builders of the class which could be used as feeder-line equipment said that they could exclusively at this type of equipment are having a market far from the wide operations of Pan American Airways and other international services, in addition to the military and naval services in certain countries which operate their own or mail services to maintain.

Every large business using airplanes, inspectors, service men, engineers, etc., are potential customers for aircraft. This is due to the poor transportation to the interior side from the regular route of international airlines.

Actually, just because in South America has been negligible for com-



mercial aircraft manufacturers, but the aviation development of sport and semi-commercial flying is beginning to be felt by the aviation group. Most manufacturers are doing business either through a recognized aircraft export organization that will both military and commercial equipment, as have specialized representatives (but have qualified themselves by terms, or the purchase of an airplane as their guarantee. In both cases there is a possibility of not being represented properly. For example, the export company is primarily concerned in military sales and unless it has an operating base in each republic, representation outside of the country in which it is located will be neglected. The individual representative, such as a demonstrator, may have out of his knapsack his equipment for personal use, and representation, though his ef-



forts may be well meant, can only be through his immediate acquaintance at in the town or city in which he is located. It is impossible at present to be properly represented, in any of the four republics named, by either a single individual or an export company except in the limited area where they are based. The situation are obvious if a map is consulted. For example, there are potential sales for some type of equipment in every large island coastal city between Rio de Janeiro and Buenos Aires. Without a demonstrator coverage of such an area would mean weeks of travel, and with a demonstrator, considerable expense that the individual or export company will not or cannot afford. The obvious solution is more attention from the manufacturers and the effort, although it will require slightly more than usual support, will certainly be worthwhile for future sales.

The export company unless operating from a base in South America (only one in operation) is in the same

(Turn to Page 27)

By H. T. Byler

Left, author on a glider demonstrator flight in a field in Rio de Janeiro. Below, two boys on a small boat in Rio de Janeiro.

Some of American export company in Buenos Aires (Company Rio Americano de Aviação)



SPARTAN

All Metal Executive



Personalized air transport features
unique structure, high performance

The new Spartan all metal executive is an airplane that speaks for itself. Without landing, twelve of these five place planes have been built, sold and delivered in the past few months and the production line at the Tulsa factory is rolling out three almost a week for delivery to waiting customers.

Carrying a useful load of 1415 lbs and powered with the Pratt & Whitney 400 h.p. Wasp Jr., the Executive has a cruising speed of 280 m.p.h. in altitude, and a cruising range of 950 miles low level, cruising speed is 200 m.p.h. and landing speed, 57 m.p.h. Dependable is at least an overstatement for any private airplane of which we have knowledge, and safety arrangement, considering the simplicity should win the approval of the most cautious customer.

Cabin entrance is by means of a wide door on the left side of the fuselage. Front seats slide back a full 18 inches to provide easy access for pilots. A low step, wide non-slip walkway, and convenient built-in controlled hand grip all combine to make the ship as easy to enter and to leave

as the bulk, and the third row seat passenger is accommodated with a convenient folding plate.

Wings and tail surfaces are fully retractable. Chord aerodynamic movement is an integral dual flap system, with vacuum operated independently controlled wing and belly flaps. Thus the belly flap alone, in all three flap positions.

Basically the Executive deserves the closest examination for the exposed dual wing and fuselage are built around a rigid welded steel tube monocoque system. This basic steel structure encloses a simple triangular wing spar and a single triangular fuselage beam. The "main" backbone is a rigid steel unit built up in a single jig and incorporating the entire fuselage spar and fuselage structure from tail wheel support to engine mount attachment. Thus all major loads are individual loading gear, engine pin load, fuel load and wing load are transmitted directly to a rigid steel main structure around which the aluminum sheet shell of the fuselage and wings is assembled. The "backbone" carries 90 per cent of all structural loads, with only 10 per cent carried through the stressed skin structure.

In contrast the "backbone" the steel tube is welded on a large jig on which is mounted the complete wing spar and fuselage beam system. Each major wing spar and fuselage beam is attached by means of three major pins to the corresponding center section spar struts and the wing spars are also fabricated as though the structure were one unit. In the "backbone" has been employed and aluminum sheet, the



outer panel spars are detailed and set in the wing jigs for assembly in the wing proper, while the fuselage beam and center section spar portion goes to the fuselage jig for primary structure attachment and shoring. It is of interest to note that not only are the wings and fuselage carefully jugged, but all component parts, such as the engine door, engine mount, etc., are manufactured in separate jigs for ease of assembly and complete interchangeability.

Wing ribs are built up of heavy steel sections, the cap strip being an aluminum formed strip. "C" section and the transverse diamond open ribs riveted in place in a jig. These ribs are riveted directly to the sheet monocoque, after suitable anti-corrosive coating. The ribs are covered with sparwire stringers, and the whole structure is then covered with smooth skin 24 ST Alclad. While the wing covering provides perfect supplementary drag strength, inasmuch as the steel monocoque provides an area drag board, this covering does impart the necessary stiffness so desirable in a high speed container wing. It is and that cost are on record where Spartan Executive three have demonstrated speeds exceeding 400 m.p.h. without a trace of wing flutter or torsional flexure.

Assembly of the fuselage is similar to that of the wing except that main fuselage backbones are bolted to the steel fuselage beams after lighter bulkheads being riveted in place and the entire framework being covered with smooth 24 ST Alclad monocoque riveted in place. Power houses forming of Alclad sheets in steel is given a smooth surface over the cabin roof at the wing root area. Two main bulkheads carry cabin stresses down to the main spar.



The "backbone" structure

structure for scattered flight stresses and non-over protection. These bulkheads are built up from heavy flat steel fused into a riveted "I" beam. Each bulkhead has been tested to a load exceeding 7000 lb.

All control surfaces are internally and symmetrically balanced. Ailerons are mounted on ball bearings and other control surfaces in pivot blocks of precision size. All control surfaces are of aluminum alloy structure with fabric covering. Controllable tabs are provided on both elevator flaps.

(This is page 46)



With the fuselage structure completed to the jig, the fuselage goes to the assembly line where additional operations, such as shoring the wing ribs, are performed.



Final assembly line in the Spartan factory. Main engine will assembly jig in foreground.



Main fuselage beam and wing spar are assembled around the steel spar in a vertical jig.



Cabin seats are assembled on jigs before installation.



IN BRANIFF'S

NEW FLEET OF

DOUGLASES



When their new fleet of Douglasses went into service, Braniff made certain that their Wright Cyclone 1,600 h.p. Engines were lubricated with New Texaco Airplane Oil.

This is the airplane oil that is increasing the entire aviation industry. This is the oil that has come through tests so severe that engine builders and airline operators found practically no wear at all.

Not only did parts look like new, but piston rings fell free and there was practically no carbon present.

Trained aviation engineers will be glad to consult with you on the selection and application of New Texaco

Airplane Oil and other Texaco Aviation Products, available at all important airports. Prompt deliveries assured through 2070 warehouse plants throughout the U.S. The Texas Company, 135 East 42nd Street, N. Y. C.

Braniff Airways' new fleet of Douglas Ships gives the flying public "friendly transportation - The Knave of the Sunlight Express from the Great Lakes to the Gulf" (New modified Mexican uniforms of Braniff houses.)



TEXACO AVIATION CYCLONE & NEW TEXACO AIRPLANE OIL FOR BUSHNELL CYCLONES AND BEANES, INTERCHANGER BEANES AND BEVE BEANES & TEXACO OIL FOR HAWKINS AND STANTON BEANES & TEXACO HAWKINS & FOR BUSHNELL BEANES AND BUSHNELL BEANES

NEW TEXACO

Airplane OIL



Engineers realize that if the pilot of a military aircraft suddenly found on many occasions during on his tail, spraying bullets, he would hang his throttle wide open and forget entirely manifold pressure gauges, fuel-air ratio analyzers, mixture and supercharger controls and the hundred and one other gadgets that line his cockpit. For practically any other state of mind, however, it is only by the constant adjustment of each individual control that he can obtain optimum engine operation for any given condition.

Presently to meet military service requirements in England, the Holston Motor Control Scheme has been designed not only to relieve the pilot of all responsibility for his engine but to reduce its number and to simplify the engine controls. With this scheme a supercharged high-speed engine driving a constant speed propeller may be completely controlled by one lever only.

The invention of the automatic supercharger regulator was the first step. This device, which is sensitive to inlet manifold pressure, limits engine supercharge by regulating the opening of the throttle valve in the carburetor. With the original control, however, manifold pressure at low altitudes shot up suddenly with a relatively small movement of the pilot's throttle lever and it needed great manual pressure after which it assumed steady proportions of further increase of the lever (Fig. 1).

Exact control of engine speed

AUTOMATIC Power Control

A British device to simplify the pilot's problem in handling supercharged engines under widely varying light conditions

By John H. Miller

A.P.A. 33

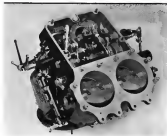
under certain cruising conditions was very difficult, particularly in formation flying. Also, which was even worse, it was possible to get full power on crossing structure strength because the power jet was fixed off the opening of the carburetor throttle.

To eliminate this "lost motion" between the pilot's lever and the carburetor throttle, the Holston Variable Datum, Boost Control (M.B.—The term "boost" is the British equivalent of "supercharging"—Ed.) was introduced, and with this apparatus full manifold pressure at any altitude up to the rated height of the engine can only be obtained with the pilot's lever in the full open position, each partial movement of the pilot's lever changing the supercharge pressure in strict

proportion to the leak through which the lever has been moved. In other words, the engine behaves as though it were supercharged.

The most obvious thing was to fix the opening of the power jet by the pilot's lever instead of the carburetor throttle. This means correct full power mixture strength at all altitudes and is the only known method by which the power jet being run can be trimmed.

To the Variable Datum scheme has now been added the three phase control which provides individual adjustment for each of the three stages of supercharger pressure, corresponding to maximum "mush-mouth" cruising, "mild", and "take-off" operation. The second operation is shown in



Motor control complete with supercharge and mixture control levered. Note Photo-graph is a twin lever M.B. Holston Motor Control Scheme (modified type). It has Supercharger fully automatic control. Also, variable datum control, also variable datum, mixture, supercharge levers for varying engine during delayed action conditions. Power, pressure for changing mixture ratio in order with Engine superchargers, all located under one body.

Fig. 2. As will be seen, three cross-arms mounted on the pilot's throttle lever shaft which work rise in step the three levers at one end of the pivoted rocker arm, the other end of which comprises the work of the supercharger engine in the control.

The center of the arm is such that the variable datum is raised progressively with the angular movement of the pilot's lever, thereby giving the variable datum effect. A slight dwell is made on the peak of each arm which is at a radius with the center of the throttle lever. These periods of dwell correspond to the three adjustable supercharge positions.

The supercharge control mechanism with its control, rocker arm and adjustments, is completely housed within the body of the carburetor (Fig. 2). Internal linkages which previously existed between the control and the carburetor are thus eliminated, and apart from the running complication and mistakes, the possibility of the adjustments becoming disturbed is avoided.

As power output is closely related to mixture strength it is essential that the correct fuel-air ratio be automatically secured for different

fuel mixings, "normal rich automatic" for rated power, and an "over-rich" mixture for take-off.

Back into the latest Holston carburetor is the Holston-Pave two-stage automatic mixture control. It has two distinct settings—one for maximum power and automatically known as "normal rich automatic" and the other for maximum economy known as "lean automatic". In either position, irrespective of altitude is automatic and is not under the control of the pilot. The manual control, previously used by the pilot for adjusting mixture strength according to altitude is replaced by a two position lever which permits selection of either "lean automatic" or "normal rich automatic" mixture for cruising.

Control Console

The throttle and mixture-control levers are interlocked on the Holston control console unit (Fig. 4).

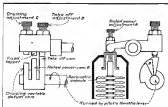
The throttle lever has three ranges of movement, over 100 degrees, and the mixture-control lever can only operate in the "lean automatic" position while the throttle lever is in the cruising range, i.e., up to 60 degrees. Opening the throttle a further 20 deg. forward to the road supercharge position automatically moves the mixture control to "normal rich" and brings in the power jet. A further 20 deg. forward movement to full open position overcomes the manifold pressure to take off pressure and automatically provides an excess mixture strength by opening the re-enrichment lever.

(Continued on page 32)

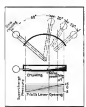


Diagram showing operation of the three-stage automatic supercharge control.

The diagram shows the difference in the shape of the manifold pressure curve for different positions of the pilot's throttle lever.



Three-phase supercharge control, pilot's lever movement and pressure curve.





Continental Aeronca

Latest Model Equipped with A-40 Series of Engines

CONTINENTAL AIRWAYS ASSOCIATES of the KC model are beginning to appear at the airports. The new production is very smooth in appearance, with the angles almost entirely rounded. The close lines of the nose of the ship carry the pilot's head in the tail group. The large comfortable cabin is completely enclosed and weather-proofed against the elements. The "tailfin" sloping windshield, the large unobstructed overhead window and the smart streamlined rear window assure a maximum of visibility. Ventilation is easily controlled by means of the large sliding windows that are raised and lowered in full-free channels. These sliding windows may be adjusted in any position to suit the occupants.

The side-by-side seat is wide and comfortable and may be removed and replaced by parachute if desired. The spring type seat is cleverly adapted to this for the pilot's line of vision does not change when the seat is replaced by the parachute. The cabin is completely upholstered and finished in

new detail. The new cord instrument panel is styled in a modern manner. Instruments of temperature and pressure gauges are grouped in a single airplane type dial. The airspeed indicator, altimeter, gas flow-off, and throttle are all conveniently located in the center of the wide instrument panel. The primer pump is furnished in standard equipment on the KC model. Two horizontal aluminum cables which are mounted in steel covered rubber bushings.

Provision in the control system has been reduced to a minimum by the use of offset levers in the altimeter and double left levers in the control column. Importance of the control system in wings and fuselage has been made extremely easy by using streamlined levers. The side-rod are the very efficient inline type. This permits effective lateral control and quicker response to the wheel. This ship has an elevator trimming tab—manually located overhead, also may be used to trim the ship while in flight. This is a very desirable feature as the ship may be flown "hands off" by the use of the tab.

Designed for long service the landing gear is of the trap type with oleo shock strut in each side. The 30 inch oval is simply used, the improved oleo strut makes the ship tow smoothly over the roughest field. Large Good-year rubber wing struts add to the smooth towing qualities of this ship.

The tail fin is reinforced to meet

the requirements of the average ship who must sometimes land on rough fields and sometimes on isolated runways. The shoe is made of studded steel and is replaceable when necessary. All hinged parts of the gear are shock-proof rollers. The pusher type tail gear has leveling levers in the end to silence the rattle. The gear is completely free from cables and vibration.

Overstrength aluminum structure allows the ship to serve longer the more Chrome-molybdenum tubing is used in all structural members in the fuselage.

Construction and finish of the pilot have been kept apparent in mind in designing this new plane. There is ample legroom space provided directly behind the seat. The sea pilot aluminum gas tank serves as winging space of 254 inches.

Specifications:
Wing span 36 ft. 9 in.
Length 20 ft. 7 in.
Height 8 ft. 6 in.
Empty weight 608 lb.
Useful load 443 lb.
Gross weight 1051 lb.
Max. fuel capacity 60 lb.
Oil 12 qt. (14 qt. optional)
Power 40 hp.
Propeller 55 in. x 30 in.
Fuel capacity 60 lb.
Max. speed 125 mph.
Cruising speed 80 mph.
Service ceiling 12,000 ft.
Cruising range 230 mi.

4 Days to Buenos Aires



PAN-AMERICAN AIRWAYS SYSTEM DOUGLAS DC-3 *High Altitude* AIRLINERS *powered by* WRIGHT CYCLONES

Pan American Airways System will soon inaugurate faster schedules to Central and South America with a fleet of giant Douglas DC-3 high-altitude airliners powered by the latest type of Wright Cyclone engines.

These powerful Wright Cyclones, supercharged to fly at high altitudes over the snow-capped Sierras of Central America and towering Andes Mountains of South America—the highest mountain ranges of the Western Hemisphere—will reduce Pan American's flying time from the United States to Buenos Aires to four days—a saving of 24 hours under the old schedule.

Over routes which for centuries required endless months of arduous travel, Pan American's luxurious airliners now speed from Cincinnati to Cincinnati in an incredibly few hours—overcoming amazing barriers of distance and linking

North America with remote and colorful Latin America.

Wright Cyclone-powered Douglas DC-3 airliners will be placed in operation on Pan American Airways' Western trunk route from New York, to Central, Panama, via Mexico and Central America—also on Pan American Great Airways to Guayaquil, Ecuador, Lima, Peru, Santiago, Chile, and over the Andes Mountains to Buenos Aires, Argentina, and Montevideo, Uruguay.

On the Eastern trunk route, Cyclone-powered Douglas DC-3 will connect with Pan American Clipper ships at Rio de Janeiro—saving 12 hours' travel to Buenos Aires.

Wright is proud of the part it has played in making possible the high-speed, dependable schedules of Pan American Airways System and other leading airlines throughout the world.



Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Weems Watch—

Second-Series Instrument Designed in collaboration with Longines

Nearly ten years ago Commander P. V. H. Weems, who is well known to students of Aviation, developed a second-series watch which has been widely used for air navigation and included in the equipment of many famous flights. Later a watch of this type for general use as well as for navigation was developed by the Weems System of Navigation in collaboration with Longines-Waltham Company, Inc.

The second series feature consists of a large central seconds hand and a movable bezel on which the second graduations are marked in operation the bezel rather than the seconds hand is moved for setting.

A standard and a wrist model are available. The standard model weighs less than two to five ounces per day and the wrist model less than three to six ounces.

A number of other types of watches and clocks for aeronautical use are included in the Longines L38—*Aviation, November, 1937.*



Second-Series Watch

No-Loss Cable—

For radio and other aircraft applications

A new 36-inch CO-X cable which is particularly useful for radio applications in airplanes, has been introduced by the Transducer Corporation,

New York, N. Y. The company reports the sale of sixteenth miles of this cable by one of its European subsidiaries in a European airplane which has adopted it as standard, not only in various land-line but also in the radio connection.

Wherever shielded coaxial cable was previously used or where it could not be used because of weight, air flexibility, or cost, the use of CO-X is recommended.

Uses of CO-X are in antenna leads, transmission lines between plane electric relays and amplifiers, in circuits where RFI or leakage losses must be a minimum, and in similar circuits where radiation or pickup must be a minimum and low leakage is essential.

CO-X is composed of three components, (1) the braided outer copper conductor, (2) the ANIHYGRON insulation, and (3) the outer conductor braid. In the past a lead sheath has been necessary to prevent moisture from attacking the insulating material. ANIHYGRON is a completely non-hygroscopic, and, hence, does not cause problems from moisture. Beside this very important feature it has the other characteristics required in a perfect dielectric: very light weight, high strength, infinite resistance, exceedingly high breakdown voltage (12,500,000 volts per inch) and a dielectric constant of 2.5—*Aviation, November, 1937.*

Tachometer—

By Kollman is sensitive through range of 2500 r.p.m.

THE LATEST Kollman electric tachometers, types 275-01, 270-01 and 277-01 add a number of distinctive features to the already well recognized advantages of the remote indicating tachometer for many installations. Among the chief claims for these instruments is the high degree of accuracy which is said to be within 30 r.p.m. throughout the working range. Types 275-01 and 274-01 are of sensitive two pointer design with a range of 2000 r.p.m., the large pointer indicating 1000 r.p.m. for each

complete revolution. The tachometers are similar except that the type 270-01 incorporates warning sectors conforming to Bureau of Air Commerce regulations. The type 277-01 tachometer has a single pointer and covers a range of 0.2000 2000 r.p.m. by providing 10 revolutions of the pointer.

All three types employ the same generator unit, and all units are completely interchangeable. Standard diameter is 3 1/2 in. and weight is under 70 lb., generator 30 lb. General features of all instruments are accuracy guaranteed to within 10 r.p.m., permanent calibration, extremely close temperature compensation, no brushes or moving contacts, no radio interference, calibration independent of length of connecting wires, two indicators may be operated from one unit.



Kollman Electric Tachometer Type 275-01

revolution, generator may be operated in either direction, drive through power bearings with life time sealed-in lubrication, minimum power and dust—*Aviation, November, 1937.*

Non-Corrosive Oil—

for batteries developed by No-Kerosene Company

AN INVESTIGATION HAS CONCLUDED it is essential to explore the use of non-loss kerosene batteries in the proposed No-Kerosene Compressor (Pittsfield, N. Y.)

held in the form, No-Kerosene is an oil for which it is claimed that battery terminal corrosion is completely eliminated so long as the No-Kerosene remains on the terminal. It is claimed to make a better electrical contact, is desiccant corrosion steadily existing, to be non-inflammable, non-explosive, non-poisonous, harmless to the hands, and contains no acids or ammonia—*Aviation, November, 1937.*



Hemlock-Rick & Becker provide power drives and equipment in use

Portable Power—

Motor-generator set for jobs remote from power lines

LACK OF CENTRAL STATIONS POWER SUPPLY is no handicap to the shop which has the new combination of a portable power unit offered by the Hemlock-Rick Corp., Port Chester, N. Y., and Black & Becker Mfg. Co., Towson, Maryland. Black & Becker has designed its tools and motor for operation from either AC or DC current, making it possible to readily employ the Hemlock-Rick power source when in remote spots. That is of special interest to aircraft operators who may in emergency be required to make repairs for frata electric power supply—*Aviation, November, 1937.*

Fafnir Cartridge—

Changes plain bearing motors to ball bearing type

Occurring as a replacement unit for plain bearing electric motors, a new sawdust type ball bearing by the Fafnir Bearing Company, New Britain, Conn., may be used to convert a plain bearing electric motor into a ball bearing motor. To effect the conversion the end-hill is bound out and the Fafnir cartridge is fitted or welded onto place. The Fafnir Ball Bearing Motor Cartridge is supplied in 43 sizes, for shaft diameters from 1/16 to 3/8 in.—*Aviation, November, 1937.*

Handy Screwdriver—

Chip-point handles steel parts

A little tool that will save many an engine mechanic's fingers and others who clear the air around maintenance shops is the handy little chip-point screwdriver offered by the Smeberg Screwdriver Corp., 2711 Belmont Ave., Chicago, Ill. Made in Made works of 4 in., 5 in., 6 in., and 7 in. the Smeberg chip-point screwdriver is non-knapable and may be operated with one hand. Through a locking trip-point in the screwdriver blade, activated by a spring release near the handle, the screwdriver both holds and drives the screw—*Aviation, November, 1937.*

New Lock Nut—

Another device to lock vibration problems in construction

THE NEW SORT can break loose these days' (unless they are a "pasty" grade "Sandy" brand) is different in thought and engineering effort that has been concerned in the development of locknuts and lock washers. A new self locking nut has appeared on the market incorporating an entirely new principle. Known as the "Uthman" and manufactured by the Standard Fastener Steel Co., Indianapolis, Ind., the new nut incorporates an integral self locking ring working somewhat on the principle of a wing-nut-and-lock washer, although the nut can be locked off with an ordinary wrench. It is reported that no vibration will occur if it is loose. In precise the "Uthman" nut can be used over and over again, and it is easily removed by hand after loosening by one or

two turns with a wrench—*Aviation, November, 1937.*

High Speed Shear—

for work on irregular shapes in 12 gauge stainless steel or alloys

CONSTRUCTED ENTIRELY OF STAINLESS STEEL IN 12 GAUGE STAINLESS STEEL OR ALLOYS, a new type shear is offered by the Liberty Machine Company, Green Bay, Wisconsin. Designed Model 1936, the shear has a throat depth of 60 in. instead of the usual 36 in. In order to handle the unusual stresses imposed the frame is made of steel fabricated and welded. It has been tested to permit shearing without starting holes, and incorporates features of precision Liberty shears. Material is sheared rather than pushed. It will not feed itself by the action of the cutters. A high degree of accuracy is maintained and there is no need of further finishing of sheared work—*Aviation, November, 1937.*

Wheel Cement—

offered by Midwest Abrasives; Samples are available

DEVELOPMENT OF A NEW CEMENT has revolutionized wheels, permitting fast replacement for wheels of canvas, leather, felt, sheepskin, wool covered with leather, compressed leather, or felt, is announced by Midwest Abrasives Company, Green, Mich. In the use of a special cement and reversed density of cement can be made up to the wheels of varying densities can be uniformly surfaced. Invented users are offered free samples—*Aviation, November, 1937.*

Die Sinker—

A handy gadget for any shop

A workman that practically sinks for the workman has been patented by Frank W. Hock, 446 North DuSoy Blvd., Chicago. Of greater significance is the construction, it is noted whenever many operations must be performed on a single piece of work. Occupying floor space four foot square, the machine is equipped to operate at a sliding table, taper, drill press, or back saw. It performs from different kinds of cutting operations with regular equipment and more through auxiliary adapters—*Aviation, November, 1937.*

ANOTHER METAL

MASTERPIECE

BY RYAN



S-C

Product of 15 years' devotion to perfecting airplanes, progeny of the "Spirit of St. Louis" and companion to a world's champion, no airplane claims so fine a heritage as the new Ryan S-C. A modern 3-place "convertible coupe" type of ship with ample luggage space, the S-C commands attention in any company for its sleek beauty, extreme maneuverability and high performance. Unlike most cabin jobs, vision over the nose, to the sides and overhead is unobstructed. The S-C is powered by a Menasco 130 supercharged engine. Another masterpiece by a pioneer builder of metal sport planes, now in production; Deliveries in rotation.

RYAN AERONAUTICAL COMPANY
LINDBERG FIELD, SAN DIEGO, CALIFORNIA

*In his stock Ryan S-C captured a field of great accolades. The Bonin won the 1937 International Aerobatic Championships at St. Louis last May.

New **RYAN S-C**

COMPANION TO THE WORLD'S CHAMPION

S-T



Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 24: The Air Commerce Bureau has been considering the possibility of limiting the numbers of large airports. When do you think it will do this? Is there some type of airport that is really the most efficient and profitable? Is there any standard for the number of airports? Is there any standard for the number of airports? Is there any standard for the number of airports?

Unnecessary of Large Ports

I WOULD REGARD MY OPINION OF THE proposed limiting of airport numbers by the Bureau of Air Commerce with a large question mark. I know just why they consider a license necessary, what the requirements for such a license would be, the regulations under which such a license would be issued and the requirements for keeping such a license.

In my opinion, the international airport of today has come a long way from the hawthorne air strip days of ten years ago. Pittsburgh for instance has become an airfield terminal and very little other activity is present. Therefore commercial and private flying is not extensive and what there is is not an operating difficulty.

Without studying the question clearly I would say there is no need of an air-

port manager's license at each airport as Pittsburgh, Chicago, Cleveland, Newark or any of the other large airports are, in the opinion of the manager at these airports, a success or less of a coordinating agent between the operation of the airport and its maintenance. Our town, for instance, is manned by qualified operators and we have two men in training for tower duty in addition to the six regular operators. We are thereby following the proposed regulations for several tower operators.

The airport management is not engaged in any flying activity of any sort and therefore no regulations on that point is necessary.

However, at airports where the management is in the flying business or in direct control of flying activity, that is, income revenue from flying, there is a definite need of some regulations to protect the public—Frank J. McLean, Director of Aviation, Pittsburgh, Pa.

Three Boies Lost

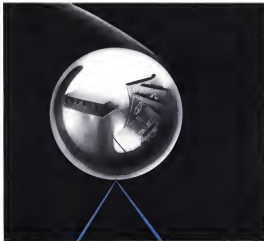
I KNOW OF THREE MEN IN THE area, all formerly able to pay each for an aircraft and an airplane, of the insurance factor had not been a deterrent—W. D. Coates, Director, Flushing Municipal Airport, Flushing, N. Y.

An Error

IN THE OCTOBER "Operator's Corner" it was stated in a reply entitled "Should be Licensed" that Mr. A. J. Hartman was manager of the Burlington, Va. Municipal Airport. The manager of this airport is Mr. Harold W. Pugh. In calling our attention to the error Mr. Pugh writes me that he has held his present position for the past six years.

Next Month's Question

QUESTION 25: What specific methods have you used in promoting your business? What kind of advertising have you used and to what has it been directed? Have you made use of outside promotion, exhibitions and with what success? What related methods have you developed for this purpose?



Balance in Production

The balance of Fafnir production between standard and specialized ball bearings results in important advantages. Because of wide range of types and sizes, standard items in the Fafnir line, engineering and production of specialized bearings can be turned to those where a definite departure from stock material is absolutely necessary.

Yet, when required, these specialized bearings are more efficiently produced because of Fafnir's extensive experience with all types. That is why Fafnir engineering and production staffs are better able to handle all customers' demands for specialized applications. And that is how Fafnir brings down costs and speeds up service on specialized bearings.



FAFNIR BALL BEARINGS

THE BALANCED LINE . MOST COMPLETE IN AMERICA



Only the Bennett Air Service offers a choice in display. No other, in addition to the one above, offers Jerry Stone Ford's unique, yet most selling experience. The student named is

managing over the public address system, the student named is managing over the public address system. The student named is

AVIATION
November, 1957



"STANDARD" AND "SPECIALIZED" ARE *Sisters Under the Skin*



The leading pace of today's industrial expansion has ranked time and again as a specialized bearing development from Fafnir today because the standard of the industry tomorrow. From its two basic Radial and Wide Inner Ring Bearing types, Fafnir has pioneered hundreds of specialized bearings which, now in regular pro-



duction, have expanded the range of Fafnir types and sizes into the most complete line in America. Every single one of these pioneering jobs has broadened Fafnir's experience—added to Fafnir's ability to pioneer further as industry reaches into newer fields—so that to-day, Fafnir offers to standard bearing users the most complete line and to those whose demands are specialized, the most complete line of experience, resulting from building that line. The Fafnir Bearing Company, New Britain, Conn.



Send for
Engineering Manual No. 35



FAFNIR BALL BEARINGS

THE BALANCED LINE MOST COMPLETE IN AMERICA

THE AVIATION

NEWS

NEWS COMMENT FORECAST

DANIEL SAYRE
C. F. McKeown, Profile Court
Riverside, California
D. S. Larkin New York

NOVEMBER 1937

Roper OKs New Civil Air Regulations

Fagg's Code Affects All Airmen Director Stays to Job's End

From Fann, the tall, brown-jawed low producer who last March stepped into the shoes of a busy director, and Bureau of Air Commerce, stepped out. He had accepted Northwestern University's invitation to come back and head the School of Commerce. Fagg has indicated, however, that he will stay at the Bureau for a number of months—he has some jobs he intends to finish.

There is the Bureau's big program for increasing and extending airway rights. With all the speed possible under government procedure, that work is now showing results out on the surface until spring. There is the reorganization of Bureau departments and personnel which started immediately upon Fagg's arrival but is not fully completed. Finally there is a matter which was mentioned: Fagg's principles, efforts a year before he became Director—the complete codification and re-drafting of all the huge mass of uncoordinated rules and regulations that have grown up around civil flying in three decades.

To help him at this last-named task, Fagg has done the start by the collaboration of John R. Wigners, Dean Emeritus of Northwestern's Law School. Since Fagg took on the Directorship, Howard Knott, another western type and a brilliant presiding lawyer from Illinois, has been carrying on the direct labors of the project.

Last month Fagg's last code was nearly done—it is a matter. The big majority of his many chapters had been signed by Secretary Roper, appeared weekly in the Federal Register, and became law effective (some in a few months) September 1. As soon as the Government Printing Office gets through printing 45,000,000 forms for the unemployment service, you will probably be sent these chapters directly containing you, if you happen to be on the Bureau mailing list. Or

you can write to for the whole business or any part of it, if you're interested.

And you'd better be interested. These new Civil Air Regulations (which get used to call them the C.A.R. or just C.A.R.) are going to keep the people you talk aviation shop-talk with, excepting all students. Whether they are field boys, mechanics, students, pilots (all grades), airport operators, officials, airline pilots, inspectors, dispatchers, flying school operators, aircraft buyers, or even model builders, this thing is going to affect their status and relationship with aviation in some way.

It's a big job, this C.A.R. If you're down with it, make through the Bureau's big mailing press you will have the latest language and the latest editing throughout and complete. But for the time being (the experts tell us) just these things make them rules not readily to power the existing codes really power.

And they are not all the same old order either. There are hundreds of

things really set down here for the first time—products of the last few years of intense design and flying progress. And—taking more of it than any other section—a complete overhaul of all studies and other's ratings.

On following pages is our look at some of the most important factors. The Bureau's new Civil Air Regulations staff is of a different, more experienced sort to increase the safety of all flying as well as a degree to better when



Earl Fagg



Howard Knott



John R. Wigners

AVIATION
November, 1937

(Continued from page 16)
 test flying has still paid enough for instrument flight. These designers are going to become part and parcel of the experiments tied to the new control techniques.

Changes in general flight rules are slight. Instrument is the exception: that plane flying below 3,000 feet in the neighborhood of a landing area must stick to the left, within a double radius of the field. Former regulations specified 3,000 feet rather than 3 miles. Under current flight rules, which are quite new, there are more restrictions on regulations than you could shake a central stick at. Maximum ceilings for instrument flight are controlled when you are at 1,000 feet by day, 1,000 feet by night, and on flight can be made clear than 100 feet below an obstacle. Another exception to the current rule is the provision that avoidance flying may be done at limited distances of the instrument or instrument altitudes thereon permit the flight to be flown with reference to the south. Instrument flight rules are laid out in great detail for the non-instrument pilot as well as the scheduled flyer. They are too intensive and detailed to present here. In general, effect there are no important changes from the regulations which have been in effect governing these two types of operations in the past, with the exception of the visual and instrument altitudes rules. They say it is quickly grasped by the use of a map, especially a map in which the current networks are laid out in color. Changing rules verbal, it seems as pretty simple to do. It's just that the visual and instrument altitudes (and instrument rules are one of them) have been designed to govern every. Instrument rules are in addition to the current rules at a given altitude, which are in a given network wherever you cross one of an instrument or instrument network and such zones have been designated as such. On these a pilot can north bound at 100-foot level, or south bound at the 100-foot level. When time comes to cross a given network, you increase your altitude by 100 feet. Although you need to pay no attention to the net network. The net network, which can parts of these zones which are not to be used any general direction follows the following rule: If the true course line between you and 100 feet take as a rule. If between 100 and 200, course line as even one. Add 100 feet to cross either under or given. Simply, isn't it?

To date the part of the CAC are also relatively of some areas (chapter in the 80 group which covers the category 10). "Maximums" from the 10 chapters will be out, dealing with all navigation outside the United States. The 10's have not yet been

submitted. To return to the navigation, one of the chapters follows together a few regulations making such the solution of these issues which affect specifically air mail operators. Chapter 10 is a few paragraphs together of regulations covering certain investigations, specifying procedures by Bureau personnel, specifying who should sit on the board (2 officers or employees of the Department of Commerce, plus two interested persons representing an association); setting forth regulations

so to witness independent testimony of investigators, etc. 11, 12, 13, 14, 15, 16, and 17 seem to be in a sort of kind of night under which our relations with the administration of CAC are contained. There are the final and possibly which can be laid on as if we are concerned of violating the regulations. There is how the Bureau will have to go about it, how it will be in our defense, how it will be in our defense, how it will be in our defense. Chapter 18 is some more definitions.

AS OTHERS FLY IT A Birds-eye-View of Aviation Abroad

The British are changing the look about their current export figures. Up to the end of August (right month), British aeronautical products to the value of £1,000,000 (about \$1,000,000) had been shipped abroad in the first eight months of 1936. Our own exports for only the first six months had been \$1,000,000, but the British figures are outstanding for a reason especially striking every production increase in a commercial program. They are big enough to say that to keep the status of British Aircraft Constructors, Ltd., in changing a position for Great Britain as "the leading supplier of aeronautical material" in their official propaganda. Incidentally the Air Ministry has recently given Great Britain the position of "the leading supplier of aeronautical material" in their official propaganda.

In our trade with France as a matter of fact, for some time we have been losing. Then, the government spends, however, losses, con-

tinued in "prototype", but the French themselves don't go far from it. Yet a recent survey showed that Civil aircraft registered with the French Air Ministry are for every 2,000 population, compared to 1,000 for every 1,000,000. Of these 700,000 registered aircraft, 104 are flying, 200 to land operators, 222 to maintenance, 100 to Air France, 11 to Air Eclair. Flying clubs increased in number during the twelve months preceding the survey from 200 to 210.

Other countries have broken through to 2nd class of the design given as would have been in an American monopoly. Officials of the French Air Ministry, for example, are deeply concerned over the situation in the Royal Air Force between the 1st and the 2nd of the September—compared with 100 to the end of 1935, identified nothing in it, even the underlying cause. . . In September a transport of the French Air Force crashed into a Peruvian mountain side and



GIEMANT ALSO—The new four-engine Junkers J90, "Der Grosse Bommer", whose the air is both preliminary in service as Luftwaffe's long run. Looking 45, it is said to have a top speed of "at least 315 m.p.h."

Adopted by the MAJORITY of the WORLD'S AIRCRAFT BUILDERS and OPERATORS ROMEC



DEPENDABLE FUEL PUMPS

The best evidence of dependability in aircraft fuel pumps is actual performance.

The strongest proof of that dependability is the adoption of that pump by the majority of the world's aircraft builders and operators.

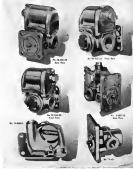
Romec Fuel Pumps had to be good—very good to be most dependable in order to merit such widespread acceptance. Whether in long distance record-breaking flights at high altitudes or in steady daily transport service, ROMEC PUMPS are those with that definite, unquestioned dependability of operation.

They have truly merited the splendid tribute received from the engineers in the aircraft industry, as well as from the world's most ardent fliers. Adopt Romec Pumps now and have no regrets.

ENGINE-DRIVEN AND HAND-OPERATED EMERGENCY FUEL AND HYDRAULIC PUMPS, REDUCING PUMPS, AIR COMPRESSORS AND ACCESSORIES

ROMEC PUMP COMPANY
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 41 Avenue B., New York City



times of poor visibility, flying sight.

Oct. 2 on Imperial Airways Empire Flying Post, the Comair, crashed while landing in a fog on the tundra at Alamos. Two were killed, five injured. Oct. 6 a KLM plane crashed near Palembang, Sumatra, killing four, including Lieutenant Hobbins, United States.

Twelve weeks 1,000 planes for its air-frames and airframes to save them by the end of 1932. Extensive orders have

been placed in the U.S. (principally with Glenn L. Martin) and other countries. Flying schools are under construction throughout the nation.

Air France has transferred from the London-Paris route, one of the best traveled air routes in Europe, from \$18.18 one way to \$10.00 thus bringing it one more level with Imperial Airways tariff. Company (the approximate 10 cents-per-mile with the \$5 cents-per-mile, the standard one-way

charge on U.S. airlines. Speaking of fares, Air France will also benefit by a new 38 cents per 100-kilometer rate and the Argentine European air-mail. The old rate was 21 cents.

What's got a good sport plane design? Sweden's largest shipbuilding concern, the Gustavson Shipyard at Goteborg, wants a license to build just such a craft for land and export markets. It is reported to be already considering several American and other types.

COMMERCIAL DELIVERIES

AVIATION'S summary of airplane marketing for the month ended Oct. 1, 1937

Particular	Type of Plane	Manufacturer and Model	Country Made and Model	Particular	Type of Plane	Manufacturer and Model	Country Made and Model
1. People	Pro	Lockheed 100	Lockheed 100	1. People	Pro	Lockheed 100	Lockheed 100
2. People	Pro	Lockheed 100	Lockheed 100	2. People	Pro	Lockheed 100	Lockheed 100
3. People	Pro	Lockheed 100	Lockheed 100	3. People	Pro	Lockheed 100	Lockheed 100
4. People	Pro	Lockheed 100	Lockheed 100	4. People	Pro	Lockheed 100	Lockheed 100
5. People	Pro	Lockheed 100	Lockheed 100	5. People	Pro	Lockheed 100	Lockheed 100
6. People	Pro	Lockheed 100	Lockheed 100	6. People	Pro	Lockheed 100	Lockheed 100
7. People	Pro	Lockheed 100	Lockheed 100	7. People	Pro	Lockheed 100	Lockheed 100
8. People	Pro	Lockheed 100	Lockheed 100	8. People	Pro	Lockheed 100	Lockheed 100
9. People	Pro	Lockheed 100	Lockheed 100	9. People	Pro	Lockheed 100	Lockheed 100
10. People	Pro	Lockheed 100	Lockheed 100	10. People	Pro	Lockheed 100	Lockheed 100
11. People	Pro	Lockheed 100	Lockheed 100	11. People	Pro	Lockheed 100	Lockheed 100
12. People	Pro	Lockheed 100	Lockheed 100	12. People	Pro	Lockheed 100	Lockheed 100
13. People	Pro	Lockheed 100	Lockheed 100	13. People	Pro	Lockheed 100	Lockheed 100
14. People	Pro	Lockheed 100	Lockheed 100	14. People	Pro	Lockheed 100	Lockheed 100
15. People	Pro	Lockheed 100	Lockheed 100	15. People	Pro	Lockheed 100	Lockheed 100
16. People	Pro	Lockheed 100	Lockheed 100	16. People	Pro	Lockheed 100	Lockheed 100
17. People	Pro	Lockheed 100	Lockheed 100	17. People	Pro	Lockheed 100	Lockheed 100
18. People	Pro	Lockheed 100	Lockheed 100	18. People	Pro	Lockheed 100	Lockheed 100
19. People	Pro	Lockheed 100	Lockheed 100	19. People	Pro	Lockheed 100	Lockheed 100
20. People	Pro	Lockheed 100	Lockheed 100	20. People	Pro	Lockheed 100	Lockheed 100
21. People	Pro	Lockheed 100	Lockheed 100	21. People	Pro	Lockheed 100	Lockheed 100
22. People	Pro	Lockheed 100	Lockheed 100	22. People	Pro	Lockheed 100	Lockheed 100
23. People	Pro	Lockheed 100	Lockheed 100	23. People	Pro	Lockheed 100	Lockheed 100
24. People	Pro	Lockheed 100	Lockheed 100	24. People	Pro	Lockheed 100	Lockheed 100
25. People	Pro	Lockheed 100	Lockheed 100	25. People	Pro	Lockheed 100	Lockheed 100
26. People	Pro	Lockheed 100	Lockheed 100	26. People	Pro	Lockheed 100	Lockheed 100
27. People	Pro	Lockheed 100	Lockheed 100	27. People	Pro	Lockheed 100	Lockheed 100
28. People	Pro	Lockheed 100	Lockheed 100	28. People	Pro	Lockheed 100	Lockheed 100
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lines will be the finest that aviation science can produce. And, in observing the details of these latest giants of the air, it is interesting to note the part played by Hamilton Standard. *Every plane in this world service, whether British, German, Dutch, or American, will be fitted with Controllable Pitch Propellers, manufactured either by Hamilton Standard or by its licensees.*

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NORDMEER...Lufthansa's new transport...by Messerschmitt, the Nordmeer.

EMPIRE BOAT...Imperial's new transport...by the North Atlantic, the Empire Boat.

ENSIGN...Imperial's new transport...by the North Atlantic, the Ensign.

SIKORSKY FLYING BOAT...Pan American's latest transport...by Sikorsky, the Flying Boat.

MARTIN CLIPPER...The American's new transport...by Martin, the Clipper.

DOUGLAS TRANSPORT...Douglas's latest transport...by Douglas, the Transport.

△t as an Element in Design

(Continued from page 33)

straight line extension of the lift curve completely independent of any behavior in the vicinity of the stall as normally measured. This matter of the presence of gusts becomes of increasing importance inasmuch as the strength of transient gusts, at least, must be decided usually by the estimated weather conditions.

Normally, all calculations of gust velocity and intensity, and the consequent accelerations are based on the sharp edged hypothesis which implies instantaneous stability on the part of the aircraft in response to the aerodynamic forces imposed upon it. It is fairly obvious that the possibility of gustiness in the air precludes the possibility of the sharp edged transient hypothesis from having a basis in physical facts.

Any ascending or descending mass of air must exert its influence on the surrounding air and in return be acted upon by the pressure of viscous forces. There must always develop a boundary defining entry into a gust.

The abruptness with which a lump is changed (or its extension at the sharpness of the gust, since, for a very moderate gradient, the maximum acceleration is reached in a very short space of time. This means that in steep but still definitely graded gusts, as they exist, the lump is felt previously and continuously.

The gradient of the gust also will greatly affect the maximum normal acceleration and if we assume a gust set below a certain value it may be impossible to attain the acceleration produced by a finite sharp edged gust even if the graded gust eventually becomes infinitely great. It is necessary to assume that the airplane moves in a straight line while with the graded gust the assumption must be that the airplane responds to some degree at least to the aerodynamic forces imposed upon it.

It is possible to find the linear gradient law for a gust such that the ultimate accelerations is that produced by any designated sharp edged gust.

The matter of the possible grade out of a gust is discussed at considerable length by J. H. Crow in *Aircraft Engineering*, May 1935, using the general equation due to Professor H. M. Jones for the case of the graded gust.

$$\frac{d(\delta + \Delta)}{dt} + x_0 \omega + \dot{\omega} = \frac{d\omega}{dt}$$

where ω is the vertical velocity of the airplane downward and $\dot{\omega}$ is the gust velocity upward. Using the mean-val value of δ to be per sq ft loading.

$$\frac{d\omega}{dt} = 4.8$$

and a speed of 200 m.p.h., the time relationship for a 25-ft. per second gust is established as

$$\omega' = -0.04$$

and the speed relationship as $\omega' = -0.01$ X, or then 1 ft. per sec. in 3 ft. It has also been shown that a rise of only 0.5 sec was required to reach an acceleration of 50 per cent of the maximum value.

It appears, therefore, that, although flight conditions are normally taken as steady in establishing the strength coefficient, for two of the vital flight conditions at least, the conditions are extremely unsteady, for which a somewhat different treatment might legitimately be required. This is also true for any accelerated case in which problems are established by considering the time inertia of the airplane. Consider, for example, an airplane in the act of landing in which a soft land run is desired only. In general, 50 per cent or more of the mass inertia of the airplane may be concentrated in the wings. The presence of a soft landing for any appreciable length of time will result in the attainment of an angle velocity and rotational movement of the wing tip. Since the rotation of the airplane is limited by the action of the wing tip on the ground, sometime at the landing gear will be subjected to loads of extremely short duration whether or not recovery is effected.

Although the previous discussion demonstrates that there may well exist conditions are extremely momentary, it provides no evidence that they should be differently treated. The amount of evidence that members behave differently under suddenly applied loads is reviewed and summarized. The most serious to the suggestion that static strength may not necessarily represent strength under momentary loads is to reveal

the real loads. Discussion which proves that the stresses developed under impact are lower than under a steady load, but practical experience dictates otherwise.

Consider a steel tube which formed part of a larger engine mount. The member was of stainless steel and tested to 92,000 lb. per square inch of tensile inside stress, during the following characteristics:

Span—3 D.D.—60" $I = 2396 \text{ in}^4$
Length, all tubes $= 601 \text{ in.}$
Area—3553 sq in. $= 194$
E (Young's Modulus) $= 28.4 \times 10^6$

This member, plus ended under stress load, was calculated to make good a stress of 25,500 lb. per square inch or a load of 15,820 lb. A certain amount of flexing probably existed at one end and at the other end the pivot was arranged along the minor axis of the section. Experiments with a similar case, however, indicated that the amount of flexing at stress in steel. On actual test the stress rose to 17,440 lb. which gave a stress of 25,150 lb. per square inch. Under this load the deflection at the center was approximately 1/4 inch which gave a further stress due to loading of 14,820 lb. per sq. in., or a total 40,000 lb. per sq. in. Although the stress was not developed in this case, but there was evidence for the belief that the maximum load had been reached, since it is a characteristic of Dural columns that, even while the stresses are low, after a certain critical load has been reached any further attempt to load the steel will result only in an increase in deflection with a consequent increase in stress, but with no greater increase in total load.

The same steel was then loaded with a definite mass and dropped at foot from from maximum height, with fixture control. Failure occurred at an acceleration corresponding to 22,460 lb. axial load in the steel in comparison to the static strength of 17,440 lb. developed on test. This difference (29 per cent) is too great to be placed out, and if it could be considered to exist in all structural members could be used to advantage in design.

Practical experience tends to bear out the idea that momentary loads are less critical than static loads. High accelerations may be developed in a pull out by pulling quickly back on the stick and then immediately allowing it forward again. As discussed diagrammatically in Fig. 3, the result is a peak acceleration of high value and of short duration. As applied to this, the stick may be thrown back until a high acceleration is developed and



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The 1937 'Reliant' powered by the new Series D Lycoming Engine (260 HP) and Lycoming Multi-Pitch Propeller is one of the outstanding planes of the year and out-sells any other make in its power class.

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STINSON AIRCRAFT CORPORATION

Division Aviation Manufacturing Corporation, WAYNE (Detroit Suburb) MICHIGAN, U.S.A.

(Continued from page 17)
maintained by proper positioning of the stick. There is evidence to warrant the belief that momentary acceleration as in the first case may appreciably lessen the strength of the stickament intended by stick trim or by a maneuver of the second sort.

If further evidence warranted the use of say a 30 per cent increase in strength for certain maneuvers, this would also cure of such things as no overlift design condition, and would provide a definite margin for use with gust conditions.

It cannot be considered from first, at least, that all stress are automatically paid for a 30 per cent over load while loaded dynamically. Differences in

materials as well as differences in presumed properties undoubtedly affect the capacity of structural members to take greater dynamic than static loads. With the increased use of monocoque construction, the characteristic may assume a still greater significance since monocoque construction is surprisingly elastic and capable of absorbing momentarily a large amount of energy.

Before any rules may be formulated for use in design and before any change in design requirements may logically be made, there is a real necessity for a test program to determine first the limits of the problem and then to determine actual behavior for use in design.

"Down Under"

(Continued from page 32)

performance as the individual representative. They usually have no demonstrator to be shown even if a sale has been made to a local buyer, because again flying is almost wholly in the vicinity of the airport and long cross country trips are made only on rare occasions. The fact that many think he has South American representation but in most cases it is only local. At present, that may be sufficient, but for the future another system may have to be developed and used to take full advantage of the market.

ALL REPRESENTATIVES in South America have sales and operating problems quite different from those in the United States. In many instances, the manufacturer is not well acquainted with the representative, having had little business dealings with him in the past. In the case of the individual representative very likely the appointment was made through a correspondence or the purchase of a demonstrator. The representative conducts his business by his country's standards and not by American methods. The manufacturer does not understand the representative's problem thoroughly, and does the representative know the limitations of the factory? All of these things account for the confusion that exists at the export business as it is now conducted. To clarify the representative's side of the picture, the following list outlines the major problems of selling aircraft in Latin

America. Naturally, the same list does not apply in total to each representative, but certain of the problems are common to all, whether or not they are individual representatives or an export company.

1. The surprising interest of the Latin American in the fact that practically every potential buyer insists on a discount and tries to buy direct from the manufacturer.

Explanation: It is due to the fact that almost all our most able and successful men consider the make-up and background of the average wealthy South American. He usually speaks English fluently, but not, usually, understands English. He is well traveled, perhaps partially-educated in Europe and he has a very definite European background. He is perfectly aware that any imported article sold in his country will be fairly high in price, because in everyday purchases most import is rebuffed. He has been buying second American and European imports for years and knows that in every instance the price is exorbitant. In the case of purchase of aircraft he knows the full price, the probable commission of the representative, probably knows the representative personally, and will make every effort to bring down the delivery cost. The representative who understands this and the money-grubbing bargain. As an illustration, an extreme example follows: A potential buyer, usually a member of a prominent family, and the owner of an American airplane in the light class had decided to graduate

to a larger job. He also knew the representative personally. Instead of contacting the representative he contacted the factory, saying it was impossible to do business with representatives. He would make the purchase of a Pioneer 3A or 4A aircraft, offering to act as their representative, and at the same time making a cash order to the factory for a delivered airplane slightly under the factory price. The factory, of course, looked the representative, but made in such a manner that the buyer had no alternative except to do business with the representative. After a considerable sum was spent in bribes, sales and views, the representative made the man a subdealer with a 10 per cent discount to close the sale, which was a mistake.

The buyer immediately contacted for another 5 per cent and the outcome of the deal was the purchase of a European aircraft at the terms dictated by the purchaser.

2. Demonstrator.—The writer knows of only three or four demonstrators (used in the sense of the word of which constitutes a demonstrator, and its availability, in the U. S.) between Rio—Buenos Aires, Santiago and Lima, as explained during the first part of the article.

3. Cash with order.—The average average set-up of a wealthy Latin American is not a ready cash one. The wealth is usually tied up in property, business or industry. The young man of wealthy family, unless he has inherited his fortune is still an alien, and under the control of the head of the family who is a prominent, doctor. This means two sales must be made, one in the family head, and one in the younger man. The younger man usually has an automobile a good allowance and every advantage, but to dig down for the full price of an airplane is one of the greatest pains he needs his own money. Most commercial factories could be kept busy all winter if all the wealthy young Latin-Americans could get their hands on their private airplanes. The companies which can be made in that American automobiles are limited on as long as a 26 month loan to top just this type of situation, which is one of the specifics in the case of aircraft. Fortunately, there are many other types of potential sales other than the individual and fortunately there are many individuals with their own money. There isn't a large business in South America which covers considerable territory with cars, equipment or materials that could not be

(Turn to page 70)

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same type of commercial equipment daily. The drawback is still in the price which again brings us back to individual buyers.

4. **Exchange.**—For example, exchange and its effect on sales. Suppose South American manufacturers and the United States did not send you, as an individual, would an airplane. Suppose also, due to economic reasons, our dollar, although good enough to buy food, clothes, and comfort between the United States, had only a 1 to 15 value in South America. Suppose the price of the machine was 2000 pesos or dollars—or \$45,000 to you, in poor dollars at that rate of exchange. Of course, the Latin American is very familiar with foreign exchange situations and discounts the cost of imported equipment as something necessary, but 45,000 units of anything, even paper clips, is a lot of pesos here. There is, consequently, no way to the exchange situation that the above explanation and its help-edges to sales, but the example given sheds some light on the matter.

5. **Representative's lack of experience.**—An expert company conducts your business or an individual acts as your representative the situation is ideal. The expert company that has more than one demonstrator bought for the purpose, and being shown throughout its territory does not get. The same applies to the individual. Usually when sales are made the buyer is expected to an agent, if he had away from the city or municipality where the representative operates. Sales are hard to make with only a reading and price list, and the best does not lie entirely with the expert company or the individual representative. The expert company probably takes care of all of South America, and the individual representative one country. If each type of representative is placed demonstrator where sales could be made, or at least one of the demonstrator, it would take considerably more financing than either would assume.

7. **Crafting and Shipping Costs.**—The amount charged by the factory for crating, even though labor and materials are high and the manufacturer makes this is an effective, it is not of proportion and has always been a sore spot with the buyer.

8. **Intercompany Competition.**—Intercompany competition is present in one respect. It maintains the characteristic features of American equipment by offering higher horsepower ratings, unobtainable ratings, but rarely obtained with true equipment, in many instances.

The higher horsepower ratings although seeming nothing but more power to get it off the ground and keep it in the air, has a peculiar attraction to a man-boat or a motor. The writer remembers lots that were made on turning a fast-sprung Fairchild 24 that it could not get off the water or two minutes, but alone carry four people with 100 horsepower, but this example of good design and fine equipment, of course, was not witnessed by all South Americans.

9. **Lack of Traveler Material.**—The individual representative works on a fairly small margin and if he based his living entirely on the sale of a commercial aircraft he could at the hospital would need education from under provision. Luckily, the representative usually is well to do or have an income from some other source. Traveler advertising material is therefore required due to outside influences and the fact that he does not have to peddle himself able to live. Some expert companies may include all advertising matter, but to my knowledge, it is left to the sub-agent who after all are individual representatives. It is not entirely necessary for studies to be in Spanish or Portuguese, but the amount of good accomplished would offset cost of translating and printing. The more problems are:

1. **Length of time for delivery.**—A station that can be reached only by sailing through the water more quickly at the factory. When the buyer asks a delivery date and the answer is from one to two months thereafter is dangerous considerably.

2. **Assembly and Delivery Service.**—Assembly is arranged for at the representative's base, which is usually in the major part of every of a country, but if the buyer is located 2000 miles to the coast in the same country, who pays the bill for delivery, who delivers the airplane, and if the buyer is in a small city without a mechanic, where will he get his service?

3. **Spare Parts.**—The spare part situation is partially taken care of by to and including the last big overhaul by the purchase of parts with the order of the airplane. Subsequent repairs or needed parts rely on air mail and loss of operation for as long as three months.

There are whole and partial solutions to each of the above problems but the way to sales and a well ordered remote must start at the factory. The manufacturer that places for sales each of the equities will be easily repaid in the future for the small amount of time and expense devoted to and in the development of this fast growing market.

Automatic Power Control

(Continued from page 20)

It, when working on a weak mixture the pilot closes the throttle to the "slow running" position, the mixture selector lever is automatically moved by the "mixture rich" setting, thus adjusting the possibility of the engine running on a weak mixture if opened up again.

The pilot on of course knows the mixture selector lever is the "mixture rich" position throughout the range of the throttle lever movement, which is an advantage for monitoring at small throttle openings on the ground.

Constant Speed Propellers

When constant speed propellers are used it is imperative that the control of mixture correction for altitude be entirely automatic and here "mixture rich" characteristics up to the output of the airplane above the flow the mixture strength with altitude is properly controlled, and perhaps pressure is relative to the

angular movement of the pilot's throttle lever, the setting of the constant speed propeller can be automatically corrected by a connection from the carburetor, instead of the cockpit.

As it is always to have the ignition retarded for starting and slow running, advanced throughout the cruising range (where it adds economy) and retarded under "mixture rich" position, this is accomplished automatically by a connection from the carburetor and the engine to a control lever to the magnet.

See Presentation

The Hubschwerk is a carburetor is combined with the Hubschwerk internal mixture control unit and provides fully automatic presentation of air-fuel mixture in the induction system. It does not require the use of limited induction, either on the introduction of hot air, which frequently causes detonation and serious drop in power.

Rationalizing Aircraft Production

(Continued from page 47)

ment and further expansion. That fit partially due to the perfection of the automatic valve gear mechanism.

Robert E. Johnson, Wright Aeronautical Corp., stated much interest was his comments on the Development of Successful Engine Installations. The three major factors in a successful installation were thought to be cooling system, fuel system, and fuel system. Much work remains to be done on handling of fuel tanks, at especially in connection with proper oil cooling. Fuel tanks were largely due to proper look and with high altitude operation approaching it was suggested that fuel tanks would be a necessary development of the near future.

Despite the most detailed design effort in the development of engine installations it was felt that engine right fitting would not be magical. Plans of this engine type carefully designed for maximum single engine performance were found to have an appreciable amount of horsepower when fires with any engine dead due to cylinder location of the receiver air scoop with relation to the single engine operating condition. Much comment was raised at the conference at Johnson's paper as to whether the engine engine receiver condition of the fire-scoop forward, should be designed and built by the engine manufacturer, or jointly as at present. T. J. Wright, of Wright Aeronautical Corp., strongly favored having the engine manufacturer do the whole job. D. E. Klein, of California Institute of Technology and the Douglas Aircraft Company, suggested there were a number of seemingly insurmountable problems in connection with such an undertaking on the part of the engine builder.

In reporting on Engineering for Production in Stoughton Street, R. J. W. Reynolds, E. G. Reed Manufacturing Company, gave many examples of the interesting methods developed by his company in applying standard steel to various rolling stock designs. He felt there was a growing field for this material in connection with aircraft to date were high. Discussion brought out the fact that Douglas had a leading expansion of steel construction, but was strong in aluminum sheet structures.

Eric Springer, Douglas Aircraft Company, gave a detailed report on

Production Control as developed in the Douglas Aircraft Company.

Outlining present plans of the United States Army Air Corps, Major A. A. Stinson stressed the importance of preparing an adequate plan for the rapid mobilization of industry in time of national emergency. He presented the battle expenditure of \$60 million dollars for American airplanes that never reached the front during the World War.

A paper on Quality Control of Aluminum Alloy Aircraft Castings by Earl R. Vaulin and Edward J. Hunk, Aluminac Company of America, stressed the value of many techniques in perfecting quality control for the production of such new type castings. There is not yet available a satisfactory method for predicting the normal service life of a casting. Tests of specimens prepared from the same mold as a lot of castings, or even of one specimen tested from a selected casting, were found inaccurate indicators of casting properties. It was suggested that any strength testing should be conducted with the casting as a whole. An examination of the service record of aluminum alloy castings in aircraft and showed that in ten years about 4,000,000 castings would have been produced by the Aluminac Company of America, with a negligible number of failures being reported. Ten Triumphs of Triumph and Better aircraft were reported, presented proposed methods and ideas to illustrate the improved techniques in casting aluminum resulting from use of a new type alloy steel.

The rapid increase in the use of magnesium castings by the aviation industry was stressed by W. G. Harvey, Aluminac Magnesium Corp., in his paper on the manufacture, properties and uses of magnesium castings. Comment on corrosion problems revealed the fact that they are not generally as serious as some have thought, though the closest attention should be given to surface protection through proper treatment. Future developments are expected to include driven and extruded sections of magnesium and layered sheet magnesium alloys for wider structural applications.

Latest developments in deep bayonet technique were described by C. B. McLeish, Lockheed Aircraft Co.,

in a paper on Deep Hammer Applications. While the deep bayonet is a useful tool, its application must be considered carefully in the light of production volume, the cost, and other practical methods.

Desirable features of Plexiglas for aircraft use were stressed by G. P. Young, of Mohan and Hase Company, in his paper Plexiglas in the Aircraft Industry. Plexiglas must under use of plastics in aircraft of the future, Young defined the two major types of plastics as thermosetting and thermoplastic, the former being capable of a chemical reaction when molten under heat and pressure which makes them thereafter incapable of being reformed through the repeated application of heat, whereas the thermoplastic softens under the action of heat and may be reformed.

A disadvantage of the thermosetting plastics is that mold costs are prohibitive on less than thousands of identical parts produced. Applications of thermosetting plastics to aircraft use were given as: gasoline system parts, control pulleys and cable guides, instrument cases, knobs of controls, molded panel boards, insulation in electrical machines and junction boxes, radiator panel work and demountable fixtures. Thermoplastics are used in windshield, window and transparent casings, inspection panels, landing light covers, adjustable instrument dial glasses, in solution as fabric finishing material (dope), in addition as a result for fuselage upholstery, oil proof covering for ignition cable, landing glasses, eye plates, etc., including fixtures and demountable parts. Future applications of large model castings to aircraft construction is predicted.

In discussing Maintenance Problems of Army Airplanes, Major Joseph T. Morris commented particularly on the increasing use of aircraft, making it difficult to keep replacement parts, as to keep a disassembled plane back to the repair base after damage in the field. He hoped that manufacturers could develop planes which would come apart into sections small enough to come within standard railroad clearances. He also considered it necessary to further develop portable repair shops mounted on trucks in order that field repairs might be performed to an extent at least postponing flying a damaged plane back to the main base for complete repair. Overhead costs now represent approximately one dollar for every five and a half dollars invested in a unit in 1932. It is believed

(Turn to page 78)

HELPING GOOD MECHANICS DO BETTER WORK



BY THE DEVELOPMENT OF 2 NEW TOOLS FOR SPECIAL TYPES OF JOBS

FOR drilling in awkward places—there's nothing like the new Black & Decker 14-inch Reel Drill. Black & Decker requires only 4 1/2" clearance—its right-angle drive will reach "around corners"—and it has the same speed and power as a conventional 14-inch Drill.

The new 14-inch Reel Drill is specially designed for drilling in shallow steel, mild steel, high carbon and non-ferrous metal. Its drive shaft is a motor reducing gear, permits turned drill into and less production time. Ask your Black & Decker Dealer to demonstrate these two new time-saving and money-saving tools—or write for complete details. The Black & Decker Mfg. Co., 222 Franklin Avenue, New York, Maryland.

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World's Largest Manufacturer of

beared that major overhaul costs on future phases will be due to repairs to landing gear, controls, and accessory parts. Importers of increasing problems was discussed by F. G. Arnold in his paper on Effect of Design and Construction on Maintenance and Overhaul of Allied Aircraft. In all too few words the paper brought out the need of a complete understanding of maintenance and overhaul problems on the part of the original designer. In an informal talk accompanied by colored slides, John Laidlaw, Vice American Airways, discussed maintenance procedures on the Pacific route.

The paper on Factory Equipment and Tooling showed D. M. Carpenter of Consolidated Aircraft Corporation, to be an accomplished humorist as well as a talented engineer. Focused concern drew attention to the peculiar nature of aircraft production, dominated by state authorities in "bureaucratic protection." Commenting on spot welding in the process the speaker had many illustrations from experience. The number of rivets in a large metal airplane was approaching a figure comparable to the national debt. Aircraft production is a three ring circus. The customer is in the first ring spending airplane rights inspecting changes into the production process until a design which started out as a business plane changes from the factory as a long range bomber. The customer is in the second ring, issue changes orders and saw drawings reinforced with descriptive language, with wild orders. In the third ring the shop is trying hard to find out what the customer and the engineering department want built. Nevertheless a recent bird—accident—has been averted but attempts to hurry. Though the shop cannot eliminate design changes it has a splendid weapon against rough customers: namely by making mistakes. The whole performance is dominated by the way the word, "Good" "Bad" may be used until every crack in the shop means a groan. Therefore the color picture is designed to end for satisfactorily repeat jobs. In manufacturing in detail on shop methods a caution was sounded against too early adoption of "mass-production" methods. An experience showed that a designer, thought to be a real money saver, was actually costing more than the beach back assembly a replacement. Aluminum alloy castings in spite of a cost saving. Spot salvage was resulting from missing aluminum strap for head face blocks, fly material, and for large tools and fixtures. Much metal cutting suc-

cess resulted from development of a new square steel designed by C. A. Van Dusen. Further efficiency and economy resulted from installing their own mass making machinery. Now a rivet starter to separate metal and steel is much needed. An automatic rivet heat treat process has been developed for uniformity of results. Good work results largely from the use of good tools, and Consolidated is constantly seeking the best tools to permit well effort.

The closing paper of the 1937 meeting by Henry A. Bodner, dealt with European Aircraft Production Development. Aircraft, particularly military aircraft, are being produced in Europe on a scale surpassing anything we know. While they are producing aircraft components more efficiently than we, due to simplicity of equipment, we are assembling the complete airplane more rapidly and efficiently due to simplicity of American design, simplicity of American skilled workers, and better materials. Aluminum alloy drag forgings, rivets, sheets and castings are far better in this country than in any other. Much time was spent in discussing a sheet metal forming process involving the stretching of metal sheets over wooden dies, with some slight amount of hand hammering while the metal is in tension. It was apparently not known to the audience that this process has for years been used to form floor bottoms built by the Daimler-Benz Company. American and European tools were found to be generally similar. In Europe excellent results are being obtained with a machine with extremely small blades, known as the Jack draw. Other unique machines are the die casting machines, widely used in German factories in place of the power hammer, and the Struckhammer, or Dipping machine, invented by the late Professor Junkers.

Out of a Hat

(Continued from page 21)

found in the aerial aircraft manufacturing operation.

Our position was unique in that a transition to aerial airplane construction for the military and transportation for commerce was not only sought but actually in scope. Many metal expansion were true. Our airplanes were just what was required of them by the military or-

ganizations. Also not absorbed into our own organization have been immediately accepted by the metal aircraft industry.

This demand for men has pointed our scouting candidates well less than two years of college training and to operate educational departments from manufacturing operations as well as justifying a combined supervision of educational and scientific talent.

From the educational department men are trained and groomed for jobs in our organizations, for our foreign associates, for other manufacturers. Since the work is highly technical it is natural that one should talk by the workshop during the nine months instruction period, but better than ninety per cent of the men are absorbed by the industry. The one simple method of production and licensing affords opportunities far as to place men service experience. Thus the three phases of our activities interact to bear the full market and the security of skilled labor.

All of this did not come down like manna from a generous heaven. It represents a good many bedroom races were in regular paths in the small hours of a good night's early morning. Our production methods are not miracles, they are thoughtfully simple—but making them simple has required no less than three years of constant effort leading up to our present willingness to announce our readiness for the low-priced market.

We have succeeded in reducing welded parts to insignificant proportions. We dislike improvisation of welding. We use metal in the early automobile with leadwork, non-confirmed parts. Repair meant the disintegration of the entire blockwork. Compare that position with the simple application of a machine-made thread and part which any automobile dealer today takes down from his rack-room shelf. We aspire to an order of simplified detail service with interchangeable die-cut sub-assemblies. And therein lies a tremendous reserve of economy. There is not a great difference in the basic structure of our airplanes with one range in price from \$1,500 to \$15,000.

This is brief in what we are doing in West Trenton, New Jersey. We think we have found some answers to some problems that have perplexed the aviation industry since its inception. And we are indubitably doing so to the discomfiture and to the kids' Messers sets.

How High

do you aim
to go in
Aviation?

To men who look beyond just a "job"
**BOEING SCHOOL of
AERONAUTICS**
offers the most complete range of
aviation training courses in America

BOEING SCHOOL OF AERONAUTICS is a career school.

It aims to develop the type of trained men the industry wants as a basis for positions of responsibility.

As the only U. S. Approved School owned and operated by a great airline (United), Boeing School is identified with over 125 million miles of airline experience. It gives further advantages through intimate contact with builders of aircraft and engines.

The teaching staff totals 30 specialists in the fields of design, manufacture, repair, flight, transportation, communication, administration and commerce. These experts are veterans, with up to 25 years of experience. And at Boeing School the average is only 7 students to one instructor—you get more than a year of individual training.

You work in an atmosphere of actual aviation activities. The school is located at United Air Lines Pacific Coast terminals, the A-1 A Oakland Airport. Air America's transpacific terminals is nearby—and there are 15 fields within a 24-mile radius. Flying weather is exceptionally good. And you have a complete range of 15 courses to choose from! Mail the coupon today!

Next regular enrollment
January 3, 1938



"AIRLINE PILOT AND OPERATIONS" ...most famed of BOEING SCHOOL'S 15 "career" courses

The course for young men who wish to qualify as airline pilots—start out on insurance positions, learn flying ability and comprehensive technical training in all phases of air-transport, use primary requirements. Students include 40 students, 100 hours dual and solo flying, advanced maneuvers and basic piloting, cross-country flight in 1000 ft. transport. Most complete training available. Duration, 10 months. 8 other Boeing School Pilot Courses.

7 Ground Courses: 1. 100 12-week "Aircraft Pilot School" course in 24 months "Air Transport" and "Personal Assessment" engineering course.

HOW MUCH EDUCATION TO ENROLL: For 8 important courses you need only a high school education. The other 7 courses require previous amount of college or special training. **BOEING BULLETIN** fully describes school, courses and requirements. Contains valuable facts on organizations, qualifications, fees, time of year, and more. Free literature and vocational counselors, and free day camp.

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YOUR TRADE SHOW in 1938!

International Air Show CHICAGO

Jan. 28 to Feb. 6, 1938

Plan now to take advantage of the greater business opportunities of the coming year by exhibiting at the only Class A. sanctioned aeronautical exposition in 1938

Space has already been reserved for more airplanes than have ever been shown at any previous exposition in the country.

Chicago will be the focal point of the aeronautical industry on the occasion of this gigantic, most all-inclusive exposition of aero-manufacture and commerce in all of their phases

Put your product in the floodlight of 1938!

Exhibit in this Industrial congress that will mark new attainments and point to new progress in your industry.

Space Reservations Now Being Made

INTERNATIONAL AIR SHOW

INCORPORATED

MICHAEL W. SCHRYVER, Gen'l Mgr.

International Amphitheatre—Chicago



SEE THIS EASY TO OWN PLANE

Already many are looking to fly their own Taylor air sport plane in the world's most popular light airplane. The safety, ease of flying, and low cost of operation make this the plane of the future. It is the only plane in the world that can be flown by a single person. It is the only plane that can be flown by a single person. It is the only plane that can be flown by a single person.

ONLY \$1495 F.A.T. Model 3400 New Construction plane. The best investment you can make.

Free DESCRIPTIVE BROCHURE SENT ON REQUEST

DESIGNED BY C. S. Taylor

TAYLOR-YOUNG AIRPLANE CO.
MILLICAN, ILL.

When you want Men

put your advertising for them on the same basis as other publicity.

If you want (dependable and efficient) men for your company, advertisement in the field served by the journal, you will naturally find the latest and most progressive men in the industry among the readers of this paper. You can get class members through a Fortune Value of advertisement or possibly find the men you need among the Fortune Value members.

AVIATION "CLASSIFIED"

REFINISH YOUR PLANE CORRECTLY THIS EASY WAY!

High speed correct results before refinishing your plane! Here's a new Colorgraph Vaneater shows you conditions of the paint and the proper way to apply it. It's the only paint that can be applied to any surface. It's the only paint that can be applied to any surface. It's the only paint that can be applied to any surface.

BERRY BROTHERS
PRINTS • VARNISHES • ENAMELS • LACQUERS
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KEEPING PACE In Modern Construction

Following the policy of constant improvement in the finished product, "Ohio" again steps forward in applying the latest type of **Unstuffed Atmosphere**, **Seamless** and **Non-oxidized** equipment to its present facilities for manufacturing the complete of reputation of "Ohio Special Quality" **Seamless Tubing**.

Thus, an additional factor of safety in aircraft construction is provided through the elimination of the former welded surface, leaving the surface clean, smooth and absolutely scale free and surface bright, a decidedly better tube to inspect and weld.



One of "Chris Clipp" engine models of "Ohio Special Quality" Chrome Molybdenum Construction.

THE OHIO SEAMLESS TUBE COMPANY
SHELBY, OHIO

SPECIFY "Ohio Special Quality NON-OXIDIZED"

UNSHAKO SELF-LOCKING NUT

You put it on—
tighten it up—
and there it stays

Vibration just can't shake it loose



Pat. & Des. Pending

It will pay you to find out all about "Unshako," the nut that can't work loose even when subjected to severe and continuous vibration—will locate all readily with the aid of an ordinary wrench. It's self-contained—no spring pins or washers to be inserted or lost. A built-in self-locking ring or fluting thread also works on the brake band principle, sets the track.

STANDARD PRESSED STEEL CO.

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Fig. 1516 "Doublet"
Self-Locking Nut

Cross section shows the Locking-Ring in position

Has many uses on
Wings Fuselage
Tail Surfaces
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Clear FLYING IN Cloudy SKIES!

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HEAVY mean clouds rolling in? You—pilot and passengers—can rely on RCA Aviation Radio Apparatus in lighting the way in safety!

Every day, more and more airplanes are flying safely and soundly with the dependable RCA Aviation Radio Equipment.

An increasing number of America's top pilots are turning to RCA Aviation Radio Equipment for every emergency situation—as well as in a

large majority of the planes using them—our RCA equipment. This modern radio equipment is increasing the safety and confidence of pilots, passengers and their loved ones alike. You can also enjoy the increased safety and comfort of RCA Aviation Radio that's RCA ALL THE WAY! So you can make this possible. That's RCA Aviation Radio Equipment of every type—for both planes and airports.

Own the radio equipment preferred by your airport and used by more planes—RCA!

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RCA Aviation Radio Equipment is sold by AIR-APPLICABLE, INC., General Sales
Company, Inc., 100 West Street, New York, N. Y.
RCA also has a sales company in New York, N. Y.



The radio equipment shown above is the RCA Aviation Radio Equipment. It is the most reliable and most complete radio equipment available today for use in aircraft.



If there is anything you want—

or something you don't want that other readers of this paper can supply—or use—advertise in it.

Aviation "Classified"

B★A★30

B★A★30 airplane wing cloth is lighter, stronger and more closely woven than other airfoil fabrics. Inquiries from dealers and manufacturers will receive prompt attention.

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The New RYAN S-C Comes to Stewart Sales

We are pleased and proud to announce that we have been selected to distribute the new Ryan plane featured in a two-page advertisement in this issue.

Ryan Sales, Charter Service
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Write or wire for full information

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AVIATION
November, 1937

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AVIATION SCHOOLS

START YOUR AVIATION BUSINESS

That's the chance you've been looking for... to have your own plane, airport and everything — AND MAKE MONEY OUT OF IT!

Many young aviators are being started airports in their towns and are taking in \$200 or more a week by our methods. Established airports, too, have been asked to give advice and are becoming about profitably with our methods. We'll show you how.

HERE'S THE PLAN—HOW IT WORKS—AND WHAT YOU GET—for only \$360 down

1. Based on New York City, world's greatest in every-day flying.
2. Trained 2000+ pilots.
3. Complete plan, training and equipment, ground, for running your own business.

ALL THIS FOR \$360
(Can be financed \$20 down, balance monthly)

For parties you work this same plan for only \$100 weekly rental, you can be successful—only \$100 down (no money out)

BENNETT AIR SERVICE

Central Jersey Airport

P.O. Box 2154, Englewood, N. J.

This is a unique and profitable business. You can have it for \$360 down, while you are young! With the complete plan and equipment, you can be successful in your own town.

Important

When starting an Airport, you must have a "Plan" of the Airport.

For the complete plan and equipment, you can be successful in your own town. For the complete plan and equipment, you can be successful in your own town.

AVIATION CAREER

OFFERS YOU GREAT FUTURE!

According to the National Bureau of Investigation, the aviation industry is the fastest growing in the world.

For the complete plan and equipment, you can be successful in your own town.

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AIRPLANE MECHANICS ARE IN DEMAND

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For Advertising of Used Planes, Engines and Parts For Sale, and Products and Services Offered, see pages 84, 85, 86 and 87

AVIATION
November, 1937

83

AIRTRAVEL

Again the USAIG is first with another new policy for the aviation industry.

Nearly one hundred thousand insurance agents, located everywhere, are prepared to help you with every aviation insurance problem, be it large or small.

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Dollars from Photography—How to Buy a Plane on \$20 a week income—Finding Jobs for Students—Ideas for Charter Service — Fixed Base Problems and Income—Instrument Training from Scratch—Flying Under the Hood—How An Airplane Opens the Door for the Salesman — The Low-Priced Airplane — Maintenance Kinks and Short Cuts — Trends in Sightseeing, Photography, Dining — Aircraft at Work, as Told by men of Business Flies—and many other articles for everyone interested in the flying industry.

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Tomorrow's Standard of the Airways The Four-Engine Boeing



Greatest combination
of speed, comfort and security
in the history of
air transportation

HERALDED as the world's most beautiful airplanes, these new Boeing transports are the latest project of a company which for twenty-one years has been prominent in the development of new aircraft trends. Their spacious passenger compartments, luxurious furnishings, modern soundproofing and air conditioning will provide a new degree of traveler comfort, backed by the assurance of four-engine reliability.

Boeing has always built tomorrow's airplanes today!





Eclipse STARTERS

In aviation, confidence starts with starting. For two decades the responsibility for this vital function has rested with *Eclipse Aviation Corporation*.

Eclipse engineering and research resources have matched the swift pace of improvement in engine design, have met the individual needs of many varied conditions of application, operation and servicing.

Eclipse Aviation Corporation offers the following basic type starters, operating from various power sources, to serve specific purposes:

POWER SOURCE	STARTER-TYPE
Manual	(a) Inertia (Manual only)
	(b) Hand Turning Gear
Electricity	(a) Inertia (Combination (DC-12 or 24 volt) Manual and Electric)
	(b) Direct Cranking Electric
Air Pressure	(a) Air Injection
Cartridge (Powder)	(a) Combustion
Electricity	(a) Inertia (Combination (AC-110 volt— 800 cycle) Manual and Electric)
	(b) Direct Cranking Electric

ECLIPSE AVIATION CORPORATION
EAST ORANGE, N. J.
(Subsidiary of Bendix Aviation Corporation)



Above: Eclipse Series 11 Combination Hood and Electric Inertia Starter for 12 or 24 volt operation available with complete remote controlled acceleration and engaging means.



Right: Eclipse Combustion Starter operating from power developed by remotely controlled igniting of concentrated energy in cartridge form.



Above: Eclipse Type E-80 Direct Cranking Electric Starter—Approximate maximum engine capacity—250 H. P.



Above: Eclipse Type E-160 Direct Cranking Electric Starter with integral bond cranking gear, for 12 or 24 volt operation and providing push button remote engine starting control.



Left: Eclipse Type Y-150 Direct Cranking Electric Starter—Approximate maximum engine capacity—145 H. P.